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IN MEMORIAM

B. C. SHANTAPPA.

On the 5th of November 1929 at 2-30 P.M. death took place after a brief illness of Mr. B. C. Shantappa, Assistant Entomologist on special duty in connection with the investigation of the Spike Disease of Sandal. Since an attack of severe cold caught while in camp at Kumsi in July last, he had not been in his normal health, but it did not prevent him from going out to Kolar in August to conduct the campaign against the *Kamblihula* pest there of which he had been in charge since it was commenced eight years ago. He returned to Bangalore the poorer in health for the strenuous work he did during the two months. He was suffering from a slight rise in temperature and a bad cough. Much against his inclinations he was persuaded to take leave but the illness gained on him and he grew weaker and weaker and died of heart failure.

Mr. Shantappa was the eldest son of a poor Christian family. He passed his middle school examination in the

first class but the circumstances of his parents were such that he had to seek service and abandon the prospects of academic distinctions which might have been his as they were his more fortunate brothers'. He had to start life as a forester in the Forest Department where he earned the high appreciation of his superiors.

When the Entomological Section of the Agricultural Department was started in 1908 Dr. Coleman selected him as a fieldman on Rs. 30. His ability, sense of duty and hard work were such that he was very soon marked for promotion. In 1910 he was promoted as additional assistant and in 1913 he was appointed as an assistant on Rs. 70. The absence of academical qualifications delayed further promotion but only for a time. He was given a grade to Rs. 150 in 1918 and in 1927 he was put on special duty in connection with spike investigation. At the time of his death he was drawing a pay of Rs. 200.

The remarkable rise from a small pay of Rs. 12 to Rs. 200 in a highly technical department is due to his tireless energy, initiative, intelligence and power of observation which more than made up for the absence of early scientific training. He never spared himself in the discharge of duties entrusted to him. Hard working himself, he extracted hard work from the men placed under him and several of the fieldmen of the section have had their training under him. His greatest service to the Department lay in the spread of entomological practices in the State and there he displayed an intimate knowledge of the ryots and their ways that I have found rarely surpassed by any officer. The village that received him coldly at first and was irresponsive to his appeals would on the occasion of his next visit welcome him with open arms. In the course of my tour in Kolar in September I made enquiries of every group of villagers I met whether I could take Mr. Shantappa away and leave them to conduct themselves the campaign against *Kamblihula*.

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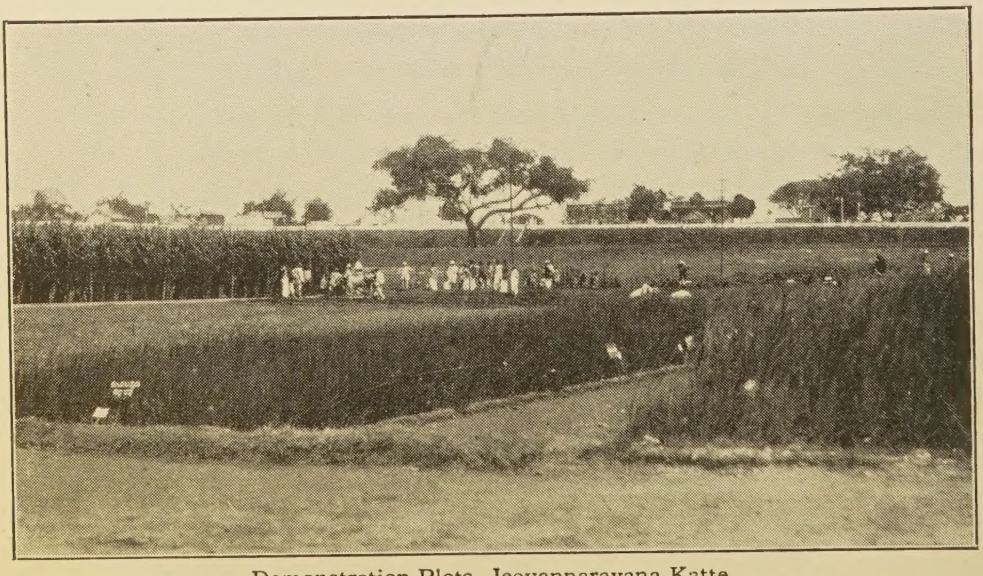
View of a part of the Agricultural Stalls.



Demonstration Plots, Jeevannarayana Katte.
Sugarcane manurial plots in the background. Paddy varietal (left) and paddy manurial (right) plots in the foreground.

Every one of these groups appealed to me not to do it, for said they, "Left to ourselves we shall not be able to do anything. He has been like a father to us, rebuking us where we failed, encouraging us where we needed encouragement. Sun or rain he has walked weary miles to help us in our work. We want him, for work will not be done without him." No tribute can be higher than this to his ability, sympathy and hard work. He is no more—the ryots will not see him again. But his memory will long live in their hearts as it will in those of his colleagues, as a man who worked hard and earned the esteem and goodwill of those for whom or with whom he worked.

K. KUNHIKANNAN,
Entomologist.

Agricultural Exhibits at the Mysore *Dasara* Exhibition and in the Districts.

BY

K. Bhima Rao, B.A.,
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Exhibitions and conferences, central and local, held periodically on occasions when large numbers of people congregate for religious or social purposes are among the principal means employed by the benevolent Government of His Highness to take stock of existing conditions in regard to all that pertains to the well-being of His Highness' subjects, and to arouse an intelligent and practical interest in improving them.

Dasara is the national festival of Mysore when His Highness the Maharaja sits on the historic throne in daily durbars ; and on the last day goes out in a grand procession followed by his principal Sirdars, and prominent officers and citizens. To undertake a journey to Mysore, at least once in his life-time, to witness this grand festival, to get a '*darshan*' of His Highness seated on his throne in the picturesque balcony of the New Palace illuminated by myriads of lights, or in the

golden howdah on the state elephant as it majestically wends its way along the crowded "Big Street" to the *Banni Mantap* is in the programme of even the poorest of the stay-at-home villagers of Mysore. No wonder the Dasara Week at Mysore has long been a centre of attraction to thousands of His Highness' loyal subjects from all over the State, not to speak of the equally large number of sight-seers it has of late been attracting from beyond our borders. *Jatras* and Cattle Fairs in different parts of the Province organized in honour of local deities are also centres of attraction, though smaller, for pilgrims and businessmen alike. Most of these occasions are being taken advantage of by the Department of Agriculture to organize exhibitions and demonstrations calculated to stimulate in all classes of visitors in general an interest in agriculture ; and particularly to open the eyes of the cultivators to the immense possibilities of improved methods and modern appliances.

I propose to present in what follows a brief description of the Agricultural Section of the last Dasara Exhibition at Mysore with a view to bring this aspect of the Departmental activities to the notice of such of our readers as did not visit the show, and to invite suggestions for improvement from those that did.

The exhibits were arranged in sections accommodated in a series of stalls in the western wing of the exhibition pavilion adjacent to the City Railway Station ; and the demonstrations were held in the tank-bed opposite the pavilion, part of which had been occupied by growing-crops, exhibiting new varieties of crops and improved methods of tillage and manuring.

At the entrance to the Agricultural Section was an ornamental arch with the departmental sign-board and artistic panels depicting some typically rural scenes of Mysore. Passing through this arch the visitor entered the stalls wherein were housed the exhibits of the several sections of the Department, grouped as under :—

i. Agricultural Chemistry.
ii. Mycology.
iii. Entomology.
iv. Economic Botany.
v. Livestock and Dairying.
vi. Agricultural Education.
vii. Veterinary Department and the Serum Institute.

Before attempting to give a description of the scope of these sections and such of the items therein contained as appealed most to the agriculturally inclined among the visitors, mention must be made of a general item of interest that elicited much praise. It was a collection of five pictures on the Ajanta model depicting a few incidents from our ancient epics which could be construed to emphasise the importance of agriculture and sanctify it. These were :—

i. The wielding of a plough by Balarama.
ii. The birth of Seetha in a plough furrow.
iii. The creation of a new Heaven by Viswamitra.
iv. The tending of cattle by Sri Krishna, and
v. Goddess Annapurna bestowing her gifts on her children.

Explanatory couplets in English and Kannada had been appended to enable the visitors to understand the significance of these pictures; but it looked as if these explanations were superfluous judging by the comments made by the unlettered but by no means ignorant womenfolk that came in to see them. These ladies were at first somewhat puzzled as to why pictures of Gods and Goddesses had been put up in a section of the exhibition which, in their opinion, had no sort of kinship with anything artistic. But just a moment's reflection made them realize the appropriateness of their having been given a place amid agricultural exhibits. "The great Balarama, an incarnation of God Vishnu, wields a plough ; why not we ? The Goddess of Wealth was born in a plough furrow ; is it not symbolical of the creation of wealth by the agriculturists ? Tenderness to the cow was a passion with Lord Krishna himself ; will we not displease Him if we are not kind to the animal ?" These were some of the observations made by them. It is necessary to attract before we can attempt to instruct, and these pictures succeeded in attracting even the non-agriculturally minded and thus served a useful purpose.

The Section of Agricultural Chemistry was the first the visitor entered, and the following were the principal exhibits he saw :—

1. Representative soils of the State, and samples of natural and artificial manures in bottles.

2. Charts indicating the composition of soils, manures and plant products.

3. Photographic enlargements of pot culture experiments that are being conducted to study the effects of some of the manures on the quantity and quality of the principal crops.

4. Graphic representation of large-scale manurial experiments on sugarcane and paddy that are being conducted on Mr. B. K. Garudachar's estates in the Bangalore and Mysore districts.

The last named exhibit arrested the attention of almost every agriculturist that came in. The experiments have been going on for over six years ; the very first year after the application of the manures there was a marked rise in the yield which has not only been kept up in subsequent years but has gone on increasing steadily. The latest figures indicate an average of about 500 mds. of jaggery and 1,400 lbs. of paddy per acre against 200 mds. of jaggery and 400 lbs. of paddy before the experiments were started. Opinion was almost unanimous among the visitors that there could not have been a more convincing proof of the possibilities of increased production by the judicious use of artificial manures. Many enquiries were made about every little detail connected with these experiments, and it would not be a matter for surprise if as a result of these enquiries the services of the Agricultural Chemist are indented for by many of the well-to-do agriculturists of the State who used to look upon the Department as a costly luxury, and the published results of the Government Experimental Farms as something not applicable to their own estates.

The Mycological Section. In this section were exhibited charts, paintings and preserved specimens illustrating several crop diseases and the methods of combating them. Materials and appliances used in this work were also on view.

Bunches of arecanuts obtained for the occasion from sprayed and unsprayed gardens in the Malnad and exhibited side by side bore silent testimony to the efficacy of the treatment recommended by the Department against Koleroga.

The Entomological Section. The exhibits of this section consisted of :—

1. Live insects—pests such as the jola grass-hopper, and the lime tree borer ; and useful insects such as the honey bee and the cactus insect.

2. Cabinets containing different insects in various stages of development.

3. Wall diagrams and posters illustrative of operations conducted against various pests.

4. Appliances such as different kinds of sprayers, sulphur duster, white-ant exterminator and soil fumigators.

5. Chemicals used in controlling insect pests.

The improved beehive with glass shutters enabling the visitors to have an insight into the working of these busy insects was the centre of attraction in this section. Specimens of cactus destroyed by insects also attracted much attention.

The Section of Economic Botany put up a good display of representative selections of all the cereals, pulses, oilseeds and other agricultural products collected from different parts of the State along with all the improved strains of Ragi, Groundnut, Castor, Sugarcane and Cotton evolved by the Department. The numerous coloured photographic enlargements illustrating the methods used in plant breeding arranged on two revolving stands were much appreciated.

Livestock and Dairying. The most interesting feature of this section was the demonstration of cream separation and butter making; free samples of cream and butter distributed occasionally contributing not a little to the popularity of this demonstration.

Possibilities of cattle improvement had been illustrated by good photographic enlargements of family groups showing the effect of premium bulls on their young stock. The more sceptical among the visitors found it hard to realize that inferior female stock shown in the photographs could be the mothers of some of the offspring. Live specimens would probably have been more convincing, and particularly so if private cattle breeders had been induced to exhibit them.

The exhibits of the Kolar Sheep Breeders' Association were very impressive. The improvement in the wool in quantity and quality—the result of selection and hybridization—came in for much praise.

Coloured pictures and posters recommending the use of more milk for children was the subject of some adverse comment on account of the fact that all the pictures were foreign. Visitors would ask if it was our intention to tell the villagers that milk was good only for

foreign children. Although it is not necessary to take these critics very seriously we must, I think, concede the desirability of using local subjects for pictures meant to appeal to our public.

Agricultural Education. Views of the Hebbal and the Chickkanahalli Agricultural Schools and of the students of these institutions at work on the fields and in the workshop and the various little knick-knacks useful to agriculturists prepared by them seemed to have specially appealed to many of the visitors who evinced much interest in educational matters. This is possibly an indication of a growing public opinion in favour of remodelling village education to make it more suited to the lives of future generations of agriculturists. The work of our agricultural schools is, no doubt, being watched with great interest by laymen and educational experts alike and the success or failure of the products of these is bound to have a marked effect on the future educational policy of our State.

Veterinary Department and the Serum Institute. The Civil Veterinary Department had exhibited small sets of medicines and instruments used in treating cattle diseases. Wall posters had been put up in Kannada giving brief descriptions of the causes, symptoms and methods of treatment of some of the common diseases.

Samples of serum and virus used for inoculation of cattle against rinderpest had been exhibited in bottles and the different stages of their manufacture shown by photographic enlargements.

Jeevanarayankatte. Standing crops of the principal food grains, fodders and green manures specially grown for the occasion ; agricultural implements of different types and makes including some crude attempts of village artisans at imitating some imported improved types and demonstrations of agricultural operations such as cane crushing and jaggery boiling, tractor ploughing and the use of different types of pumps for lifting up water—all arranged in the spacious grounds of the Jeevanarayankatte opposite the Exhibition Pavilion attracted a smaller but, more select, set of visitors in spite of the fact that there was no entrance fee for this section of the show. Still this section of the Exhibition must be considered the most popular especially among the *bonafide* agriculturists. They repeated their visits day after day and spent quite a number of hours each day making a detailed study.

There was one defect in the crops section which did not escape the attention of the visitors, *viz.*, the unconvincing manurial experiments. Judging by their appearance no difference was observed between the manured and the unmanured plots. All were equally good. This was no doubt due to the very rich soil of the tank bed on which these plots had been laid—a circumstance not in our power to alter. Clean cultivation, good drainage and differences due to varieties were, however, points which received much approbation.

A very striking feature of the implements and machinery section was the variety of exhibits and the ready co-operation of private dealers (Kirloskars, Volkart Bros., Coopers, Madurai Mudaliar and others) and other Government Departments in conducting demonstrations. It was very gratifying to note that in the comparative trials of sugarcane mills an enterprising local mill made out of Mysore iron came out first.

Besides this Central Exhibition at Mysore smaller exhibitions were organized last year at some of the district and taluk headquarters—Hassan, Chickmagalur, Bangalore, Anekal and Srinivaspur. Attempts were made on these occasions to select items of special interest to the respective localities and give them greater prominence than the rest. The visitors at these mofussil exhibitions are generally a little different from the Dasara crowds at Mysore. They are more rural in their sympathies and more keen about learning and devote more time to study the exhibits subjecting the persons in charge to a severe cross-examination. Undoubtedly these mofussil exhibitions serve the genuine agriculturists better than the Central Exhibition at Mysore.

The Dasara Exhibition has now become an annual function and so are some of the District Exhibitions. The question how best the interest of these shows can be kept up year after year requires some thought. It is almost impossible to satisfy the tastes of a section of the public that come into the stalls with the question "Have you anything new to show?" and feel disappointed if they are told that there could not be much that was new. Frankly if all that could be learnt at one of these shows were actually learnt and put into practice by all the agriculturists that visit them and if we did not expect different batches of agriculturists interested in

knowing what improvements they can introduce in their practice to visit these successive shows (apart from the recurring stock of mere sight-seers) there would be no excuse for holding these shows at such frequent intervals. Both these conditions do not exist. It is only a very small fraction of the *bonafide* agriculturists of the State that take advantage of these occasions, and the success of propaganda of any kind is generally in direct proportion to the degree of persistency with which it is repeated. Still it is necessary (i) to see that every attempt is made to add something new to the stock of exhibits by incorporating the latest results of experiments, specially of those that are being conducted by our private agriculturists, and (ii) always to be on the alert to present old facts in forms found by experience to be more appealing to our raiyats. Members of the Experimental Union who are conducting experiments on the several improvements recommended by the Department will be helping the Department in attempting the first by promptly communicating their results. The Departmental officers will try to do the rest.

Cultivation of Peas round about Ramakrishnapur, Anekal Taluk, Bangalore District.

By

H. Venkoba Rao,

Agricultural Inspector.

In the villages of Iglur, Nayanayakanahalli, Banahalli, Hinnakki, etc., peas are cultivated to an extent of about two hundred acres annually purely as an irrigated money crop. It is a vegetable and as such it is no good attempting to grow it unless there is a very ready market. So far as the produce of this locality is concerned, the green pods which may amount to more than a hundred and fifty tons in the year, approximately valued at Rs. 30,000, finds a ready sale in the Bangalore Cantonment market from where it is exported chiefly towards Bombay.

Varieties :—The plants of the variety grown are of medium height (3′ to 4′), are a mixture of *Gidda* (short) and *Dodda* (tall) types and are always staked. There is nothing else to differentiate one from the other except in the shape and size of their pods. The pods

of the former are slightly narrower and shorter than the latter. (The mixture, they say, gives a more prolific growth and yields better than the growing of any one type.)

Soil :—Though peas are grown on all wet lands under tanks and wells, they seem to thrive best on rich light clayey loams irrigated mostly from wells. The plant cannot withstand water-logging in the least.

Season :—All the year round peas are grown ; sowing in April-May (*Revati, Asvini, Bharani*) does best so far as the yield is concerned but commercially it is the least profitable. Sowing in summer after February is sometimes abandoned as the plants dry up in spite of plenty of watering. Nevertheless the summer produce is four to six times more valuable than that of the rainy season.

Precaution in sowing :—Cool winds seem to favour the natural growth of the plant besides warding off the terrible disease—mildew—which attacks peas. With the object of aiding good circulation of the cool breeze usually coming from either west or east, peas are always sown in rows running east to west.

Preparatory cultivation :—The land is usually ploughed twice with the mouldboard or country ploughs. The mouldboard ploughs are used in great numbers in these parts. Ploughings are done after good rains or by irrigating from wells or tanks. If the land is very badly uneven after the harvest of paddy, it is levelled roughly at least on blocks of one-tenth or one-eighth of an acre. The furrows are opened with the *guddali* (hand-hoe). Three or four such blocks are all that an individual generally plants at one time with peas, as otherwise it will be too much for him to properly attend to staking and irrigating the crop. Sometimes the furrows are opened with a country plough. The furrows are made half foot deep and half foot wide into convenient lengths of 10 to 15 feet at the head of which runs the water channel. A distance of four to six feet is allowed between furrow and furrow for allowing people to go about in between them for staking the plants, hoeing and picking of pods and other operations. The growth of plants would be better and more vigorous in lands which are prepared some time, about a month, before sowing than in lands prepared immediately before sowing.

Manures and manuring :—A mixture of cattle manure and fresh earth at the rate of 5 to 10 cart-loads per acre respectively is then worked into the furrows. The application of fresh earth is sometimes dropped in which case the dose of cattle manure is increased by four or five carts, if not doubled.

Seeds and sowing :—Seeds are dibbled by hand 2″ to 3″ deep and $\frac{1}{2}$″ to $\frac{2}{3}$″ apart in the furrow at the rate of twenty-five to thirty *seers* (Mysore) per acre, preferably in dry soil. This works out at eighteen to thirty seeds for the length of a foot. Wrinkled seeds (known as "ಸುಕ್ಕುಳು") or immature greenish coloured ones are rejected and only whitish coloured good seeds are selected for sowing. Seed meant for sowing purposes are generally dried well previous to storing and sprinkled with lime dust.

After cultivation :—Germination takes place in 5 days after dibbling. After the plants have come up they are hand watered for three to four weeks as follows :

Once daily during the first week : 7 to 8 waterings.

Once in two days during the second week : 3 to 4 waterings.

Once in three days during the third and fourth weeks : 5 to 6 waterings.

When the plants are about 9 to 10 inches high, they are staked, usually with lantana stems which are got from the waste lands or hedges. Nearly five to six cart-loads of lantana stems would be required to provide stakes for an acre of peas. These stakes are not as durable as bamboo branches used in some rare instances.

While staking, the crop is earthed up and the irrigation channels are deepened. Then follows the irrigation of the crop from a well or a tank whichever may be the source of water supply.

At the beginning only light irrigations are given and if the rains fall in the meantime no irrigation is given at all for fear of water-logging. Later on, copious watering is given at each irrigation and the number of irrigations also, in case no rains are received, is increased. Sometimes two irrigations are given daily when the picking of pods has begun. Some thirty to thirty-five irrigations are found necessary for a summer crop.

Harvest :—The plants flower in about 32 days and the first set pods are ready for picking in about 55 days after planting. Thereafter there are about eight to ten more pickings at an interval of four to five days between one picking and the other. Usually the later pickings are bigger than the first one and the last picking is equal to the first picking. The pods are usually handpicked by a batch of two coolies per row, going simultaneously on both sides of it.

For seed purposes, pods enough to give them the required quantity of seeds are not picked, allowed to ripen and dry on the plants. These dry pods are not picked separately but the entire plant is pulled off the ground. Both the plants and pods are further dried in the yard and thrashed with a stick when the seeds separate easily from the pods and are gathered, cleaned by winnowing and stored after drying thoroughly for a couple of days.

Yield :—1,500 to 2,500 lbs. of green pods and 70 to 100 lbs. of dry seeds are the usual outturn per acre. As in the case of potato, one can never be sure of reaping a good pea crop.

Rotation :—When grown under tanks, peas occupy the land for three months, between May-July, at the end of which period paddy follows either as *punaji* (dry sown) or transplanted. Sometimes it takes the place of regular paddy in the year and peas follow peas. There is no recognized rotation for the crop. Crops like cucumbers, beans, irrigated *ragi* (Eleusine coracana) are sometimes cropped between one crop of peas and another.

Insects and other pests :—Two kinds of caterpillars eat the seeds by boring through the pods and aphis attack leaves and shoots. This is nothing when compared with the loss due to the attack of field-rats on germinating seeds and growing pods. They are kept away by traps, hunting, poisoning and growing bait crops like paddy.

Diseases :—Mildew is the only disease of any seriousness which this plant suffers from and which is dreaded by cultivators. Though it is a recognized fact elsewhere that this can be controlled by spraying with Bordeaux mixture, ryots of this locality are quite unacquainted with its use. Anyhow the rainy season crop is less susceptible to the disease than the crop of other seasons. The disease is virulent at the time the pods are picked.

Cost of cultivation :—

	Rs.	A.	P.
Ploughing : Two	4	0	0
Levelling, making furrows and applying cattle manure and fresh earth, 10 men at 6 annas each.	3	12	0
Cost of 10 cartloads of cattle manure	10	0	0
.. 5 ,, fresh earth ..	2	8	0
.. 30 seers (Mysore) of seeds at Re. 1-8-0 per seer	45	0	0
Dibbling : 8 men at four annas each	2	0	0
Hand-waterings 18 (on an average) at as. 8 each	9	0	0
Lantana stems : 4 cartloads at as. 4 each ..	1	0	0
Staking, earthing up and deepening irrigation channels : 10 men at as. 6 each	3	12	0
Irrigations : 36 (on an average) at as. 8 each ..	18	0	0
Picking and threshing : 80 coolies at as. 2 each / 4 coolies at as. 4 each	11	0	0
Land tax	5	0	0
TOTAL Rs. ..	115	0	0

Value of Produce :—

First two pickings and last two pickings of green pods 200 seers (Mysore) each on an average ..	800 seers.
Middle six pickings at 300 seers each on an average	1,800 seers.
TOTAL ..	2,600 seers. or (1,950 lbs.)

	Rs.	A.	P.
Cost at one anna per seer	160	0	0
40 seers of dry seeds at Re. 1 per seer.. ..	40	0	0
TOTAL Rs. ..	200	0	0
Net profit per acre .. Rs.	85	0	0

This figure is very variable. When good showers fall during growing season, the irrigation charges come down or when more favourable rates are got for the pods (ranging from 1 anna to 8 annas

per seer) and seeds (ranging from Re. 1 to Rs. 3 per seer) the profit from the crop is sure to be more than what is shown above.

When the cultivation of peas is attempted through tenants the land-owner has to provide them with water facilities and supply them with seeds and get half of the produce, or get only one-third of the produce.

Suggestions for increasing the profit :—The above description is a result of the observations of the cultivation of peas made in the neighbourhood of Ramakrishnapur. From these facts and figures a few suggestions for increasing the profit from peas may be made.

1. Selecting light clayey loams not likely to be water-logged under any circumstances.	At present low yields and failures are attributed to these points not being scrupulously attended to.
2. Providing good water supply	
3. Using only sound, plump whitish coloured, uniformly big sized seeds.	All sorts of cheap seeds are hastilty got and sown at present.
4. Dibbling in double rows on either side of stakes.	Practised elsewhere and found paying.
5. Testing all existing and available types and selecting one or two of the best for qualities like resistance to water-logging, immunity from mildew, high yield, etc.	At present no attention is paid to selecting seed.

6. Using bamboo stakes instead of lantana ; the former are sure to last for a longer period than the lantana.
7. Using artificial fertilizers used and found paying elsewhere.
8. Hoeing the interspaces with implements like Planet Junior hoe with a view to, if possible, minimise irrigation and aid better cultivation.
9. Keeping away rats from germinating seeds and green pods *effectively*.
10. Resorting to spraying with Bordeaux mixture against mildew.
11. Forming a co-operative organization for the selling of green pods first and then for all other transactions concerned with the pea cultivation, such as transport of pods to the market immediately after the harvest, seed storage and supply,

purchase of artificial fertilizers and their supply. his is very important as at present the producers are at the mercy of the middlemen who not only knock off one-fifth of the produce as their commission but also use bigger weights and give the lowest rates possible.

A Tour in the Malnads of Mysore.

By

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Every year a trip is undertaken to enable the final year students of the Agricultural School at Hebbal to study on the spot crops peculiar to the Malnad region of the Mysore State. As the observations made during this trip may be of interest to others an attempt will be made to give some of the more important points that were observed during this year's tour.

The tour started off with a visit to the lands near Bhadravati reserved for the agricultural colony. This block of land consists of varying grades of soil with a fair amount of scrub and small jungle which has all to be cleared before the land will be fit for raising any crop. The initial work will be heavy and arduous and it remains to be seen how many colonists will survive this period.

While at Shimoga, the students were introduced to a scheme of co-operative farming being worked out by a local *jodidar* with the help of the Agricultural Inspector working in the Co-operative Department. The details have not yet been worked out. When they are, there may be an opening for such of the graduates of the Mysore Agricultural School as are willing to take up farming but lack the facilities to do so. This seems to indicate that many people are alive to the necessity of developing agriculture on modern lines and ready to give encouragement to men who can undertake farming on the most approved lines.

Hosahalli—Mathur, a village near Shimoga, on the banks of the Tunga, was visited as affording an interesting example of the success of farming by a community which has no tradition of farming. By sheer industry this community has succeeded quite well, and the village seems to be a very flourishing one. They are engaged on areca

farming on an intensive scale. When they started farming they seem to have done all the field work themselves without any hired labour. It can be seen even now that they are experts in all kinds of garden work. Of late they seem to have a tendency to employ more and more of hired labour for the harder kind of work such as tree climbing and harvesting. The industry of the Mathur people is a byword in many areca growing places and it would be hard to compete with them in the matter of areca shelling especially. It was an object lesson to the students as demonstrating what can be done by hard work even along unaccustomed lines of work.

Another interesting place near Shimoga is Gadikoppa, where the whole village practically is engaged in the dairy industry. A large number of buffaloes are reared here. The peculiar thing is that the calves are fed by hand right from the birth. The calves were very healthy indicating that the popular impression that buffalo calves are very difficult to rear is incorrect. Another noticeable thing is the attachment that seems to exist between the buffaloes and their cowherds. There is considerable room for improvement with regard to the sanitary arrangements but this village shows what can be done in the way of establishing dairy herds in suitable places.

About a week was spent in the study of the cultivation of arecanut round about the Marthur Farm. The cultivation of arecanut has been systematised to a remarkable degree and one finds very few deviations anywhere except in the Government Farm where various experiments are under way. Great trouble is taken to follow a particular system of cultivation which allows of periodic manuring and thorough cultivation of the whole garden. The one great enemy of the areca grower is the Koleroga which has been successfully overcome by the methods of spraying recommended by the Department after a considerable amount of research work. Although great progress has been made by the Department in this work, yet much remains to be done so that we find in many places both spraying and the old methods of fighting the disease in use side by side. Some people seem to be of the opinion that under certain seasonal conditions, the only way of fighting the disease is by the old methods. So far as the marketing is concerned there does not seem to be any great efforts at co-operative sales and this lack of a co-operative organization very often

places the areca growers at the mercy of the middlemen. We are everywhere met with woeful tales of the indebtedness of the areca growers generally and it seemed as if a good deal of this was due to the want of co-operation and combination among the areca growers themselves. Interesting experiments are under way on the Marthur Farm with regard to the construction of areca dryers and these ought to help the growers considerably during unfavourable seasons.

The cultivation of arecanut at Tirthahalli does not materially differ from that round about Sagar. The preparation to market differs slightly as also the method of shelling the nuts. Here also the middlemen seem to get the most profit out of areca. There must be room for a strong co-operative organization for marketing arecanut and it seems worth while for attempts to be made in the direction of establishing such an organization especially as it may go a long way in reducing the indebtedness of the areca growers.

Between Tirthahalli and Shimoga is the estate of Mr. Subramanya Bhat at Tenginakere. It is an education to visit this place, as it shows what an intelligent man can do in the way of farming and how he can develop all the resources at his command, leaving himself time for certain hobbies and recreations. The proper way of laying out an areca garden and planning out the planting of areca at different stages can be seen here. Quite successful attempts have been made at the growing of certain fruit trees under dry conditions. A big plot on the hill side has been put entirely under jack and cashew nut. The trees are quite healthy, not much expense is incurred in the way of cultivation and the returns seem to be not inconsiderable. Cocoanut is successfully being grown in a locality where it is not supposed to thrive. Quite a considerable area is put under sugarcane and the many little devices that have been improvised for the making of jaggory, for the threshing of paddy, all testify to the great attention that has been paid to details by the proprietor. It was remarkable how ready he seemed to be to try any new methods and varieties of crops that came to his notice. This open mind towards new methods and varieties has enabled him to secure some really good varieties of crops and methods of cultivation. Mr. Subramanya Bhatta's estate is well worth a visit by any one who is at all interested in the agriculture of the Malnad.

About a week was spent in the study of the cultivation of coffee and tea round about Koppa and Balehonnur. Round about Koppa coffee did not seem to be very flourishing, although in some places quite good crops were noticed. A large area round about Sollebile is being put under tea. Although quite good tea is being made at Aligeshwar and tea seems to be growing well, yet people did not seem to be very optimistic of the success of tea growing in those parts. One feature of tea cultivation is that the first has practically disappeared in these areas and it remains to be seen how this large-scale denudation of forests will affect the climate and healthfulness of the locality.

The season seemed to be a good one for coffee and all over this area the coffee plants were carrying a very good crop. The bringing back into shape of an abandoned estate was seen to be a tedious process. The slightest neglect soon ruins a coffee estate and the importance of careful cultivation of an estate year after year irrespective of the crop obtained was quite evident. In some estates were seen quite successful attempts at renovating old plants by pruning the stem almost flush with the ground and allowing a side shoot to develop. This is an inexpensive process of getting rid of old plants and replacing them with new ones. Rubber was seen at Malgode. Owing to the low price of rubber tapping had been discontinued.

Interesting work is being carried on at the Coffee Experiment Station at Balehonnur. Manurial experiments of various kinds have been under way for some years now. Extensive spraying operations were being carried on by means of different kinds of sprayers, including a power sprayer. Different methods of grafting are being tried and a fair amount of success has attended this work. With first class laboratory facilities which will soon be available there and with fairly good accommodation for the officers, one may look forward to the obtaining of very valuable results in the near future.

The visit to Sacrepatna area was very instructive as showing the possibilities of the development of fruit cultivation in the neighbourhood. Citrus fruits seemed to thrive particularly well, as well as cocoanuts and various other kinds of fruit trees. Sugarcane too had grown very well and it seemed as if this area was particularly suited to the development of intensive farming.

The halt at Belur was instructive in many ways. The cultivation of sweet potatoes as a dry crop seemed to be a regular practice here and it was astonishing what size some of them attained. Mr. Surappa of Ganayakanhally has succeeded in establishing a farm here after a considerable amount of trouble. From the position of owning a few scattered bits of land. he has, partly by exchange and partly by purchase, succeeded in now having one big compact block of land for himself. Similar attempts ought to be successful in other parts too if undertaken in the proper way. A certain amount of give and take will be necessary and in consideration of the advantages to be derived from a consolidated holding, one will have to be prepared for not getting the full value in all transactions. Under the new channel that is being opened here, there seem to be available small blocks of land, now waste, suitable for developing into small farms. It will be worth the while of such of those passed students of the Agricultural School who desired to undertake farming on their own account, to investigate the possibilities of doing so in this locality.

The system of cultivating sugarcane under the Halebid tank is interesting in that it is grown in a compact block every year. All the landowners in one block agree to grow sugarcane in any one year, the size of the block depending upon the water supply in the tank. Every farmer is content to grow sugarcane once in three years and thus by mutual agreement a good deal of worry and expense is saved. Manufacture of jaggory is done sometimes on contract by professional gangs of jaggory makers and sometimes by the cultivators themselves.

Round Saklaspur, a study was made of cardamom and coffee. Where the rainfall is more than 100 inches and to the west of the river Hemavathi, cardamom flourishes very well. To the east of the river coffee grows well. In some of the coffee estates here, spraying operations are being carried on on an extensive scale and with very good effect. Cardamom cultivation seems originally to have been restricted to the banks of streams and streamlets and no particular care was taken about its cultivation. With the increasing price for the commodity, its cultivation has been extended to all available places and at the present time cardamom has become a regularly cultivated crop like coffee, extending over a wide area. Ordinarily cardamoms are dried in the sun, but as sunlight is uncertain in the picking season, various kinds

of driers have been built by the planters. The opinion now seems to be that cardamoms dried in specially constructed driers where the conditions are so regulated that the dried product has a more or less uniform greenish tinge, command a better price than the sun dried ones which are a dirty white in colour. It is said that it is easier to bleach the greenish cardamoms obtained from the drier than the sun-dried ones. Here again, the growers are more or less at the mercy of the middlemen who come from Haveri, which place is supposed to have a monopoly of a kind of water best suited for bleaching the cardamoms. This idea enables the Haveri merchants to dictate terms to the growers most of whom are obliged to sell to them to meet their financial obligations. The situation sometimes seems to become very critical and yet nothing has been done to organize a co-operative sales and bleaching business at Saklaspur —a very effective means of breaking the monopoly of the Haveri merchants.

At Byakeravally we saw the devastating effect of "die back" on coffee. What looked an exceedingly good crop at the initial stages had become a very poor one. Nothing could be done to prevent the loss, it was said, and the planter had merely to look on.

Hassan was reached when the preparations for the cattle show were in full swing. A very large number of good cattle had come from all parts and advantage was taken of this show by the Agricultural Department for arranging an exhibition on a small scale, to demonstrate the activities of the Department.

Sugarcane was being grown round about Hassan and the outlying places. H.M..320 seems to have taken a good hold. Local canes are allowed to stay in the ground for eighteen months. Jaggory making is usually done by professional boilers.

Round about Channarayapatna, a large area is put under Cheni cane which occupies the ground for eighteen months. This seems to be the centre for professional jaggory makers, who handle all the cane in the area and go outside when there is no work at home. A foundry has been established here by a local merchant for the manufacture of sugarcane mills. All the professional men buy their mills from this place as, firstly, the initial price is low and, secondly, they can get any spare parts or any repairs done quickly and on the spot. There is thus very little scope here for the distribution of mills other

than of local manufacture unless some arrangements can be made to take over the old mills and to arrange for a ready supply of all spare parts. It is surprising that very few of the farmers seem really to realize the losses they are having by smaller extraction. Some amount of special propaganda in this connection seems to be quite necessary here.

A visit to Jamboor was interesting in that the students had an opportunity of seeing what an educated man could do in the way of farming and how he could get the best out of the land.

Mr. Mylariah, a member of our Union, has done very interesting work in the way of renovating an old cocoanut garden which was practically running to waste. He has taken up sugarcane cultivation on a large scale. The local cane is Cheni but the gentleman has been conducting trials with some of our new varieties and has been using artificial manures on sugarcane systematically. He has allotted small plots to the youngsters of his family each one of whom is entirely responsible for the whole work on his plot. The nature of the experiment and the kind of work to be done is explained to the boys to enable them to gain an insight into the work of farming and appreciating the rationale of the work to be done. Such training given to the boys cannot fail to create in their minds a bias in favour of farming and a love for the profession. This is a concrete example of an educated man (Mr. Mylariah is a graduate) making a living by some work other than government service incidentally serving as a good example to the surrounding farmers.

Interesting experiments on paddy transplantion were being carried on by Mr. Anantharamiengar at Dadadahally. All these tend towards considerably reducing the seed rate and the results obtained there must be given a chance to spread. This is another example of what an educated man can do if he turns his attention to farming. Areca and paddy cultivation was studied at Amritur. The conditions obtaining here are essentially different from those obtaining in the malnads, but the situation under a big tank seems suitable for areca. Attempts are being made here to grow coffee in the areca gardens. So far, the plants seem to be doing well and it remains to be seen if it will be a profitable venture.

On the whole, the tour was very instructive, and gave opportunities to the students of studying agricultural operations under varying

conditions. They could see that farming was an occupation which could not only give a good living to an industrious man, but there was full scope for the utilization of a man's intelligence and afforded splendid opportunities for service of all kinds to the comparatively ignorant people in his neighbourhood.

Sannhemp *(Crotolaria juncea)* as Green Manure for Potato and Onion Crops.

By

H. Lakshminarasimhiah,
Agricultural Inspector, Chikballapur.

Sannhemp is being used as a green manure crop for paddy and sugarcane but it is very rarely used for onion and potato crops. The reason seems to be that people are not sufficiently enlightened in the matter. A consideration of the facts and figures of a case wherein sannhemp was used successfully as a green manure, shows how profitable the practice is.

Mr. Sonnappa of Nandi, Chikballapur taluk, had sown 20 seers of sannhemp seeds about the middle of September 1928 in half an acre or 20 *guntas* of land and when the crop was two months old, it was cut and buried in the soil by ploughing. After the green plants were allowed to rot within the soil for a period of 15 days, potato seeds for quarter of an acre and onion seeds for another quarter of an acre were sown on the 25th December 1928. For comparison, he repeated the two crops on another half an acre to which merely 12½ cartloads of cattle manure had been applied.

A comparative statement showing the yield obtained by applying sannhemp *plus* cattle manure and that obtained by applying only cattle manure is given below :—

Kind of Manure		Total cost of cultivation for 10 *guntas*	Cost of manure	Total cost of cultivation for 10 *guntas*	Yield for 10 *guntas* with value	Net income for 10 *guntas*	Net income per acre
POTATO	Sannhemp *plus* cattle manure.	10 seers *plus* 2 cartloads	Rs. 2-0-0 *plus* Rs. 3-0-0	Rs. 40-0-0	110 mds. or Rs. 110	Rs. 70	Rs. 280
	Cattle manure only	6¼ cart-loads	Rs. 9-4-0	Rs. 46-0-0	95 mds. or Rs. 95	Rs. 49	Rs. 196
ONION	Sannhemp *plus* cattle manure	10 seers *plus* 2 cartloads	Rs. 2-0-0 *plus* Rs. 3-0-0	Rs. 35	120 seers seeds Rs. 120	Rs. 85	Rs. 340
Seed-crop.	Cattle manure only	6¼ cart-loads	Rs. 9-4-0	Rs. 40	100 seers seeds Rs. 100*	Rs. 60	Rs. 240

The potato and onion crops treated with cattle manure alone were given four and two irrigations more respectively than the plots which received both cattle and green manures. This accounts for the higher cost of cultivation of plots receiving cattle manure alone.

The potatoes treated with cattle manure only, came to maturity a week earlier than those in green manured plots. There was similar difference in the onion plots also, the crops in the cattle and green manured plots being harvested on the 29th March and 4th April 1929 respectively. The delay due to green manuring is not very considerable.

From a study of the above it is clearly seen that green manuring is profitable for potato and onion crops. It not only minimises the cost of manuring but also increases the fertility of the soil enabling one to get an yield of from 15 to 20 % more than what could be got by applying cattle manure alone.

* The estimated money value of the onion crop seems to be too high when we remember that about the time of harvest last year onions were selling at three maunds to the rupee. At that market value it would be a question whether onion is the most profitable crop to grow. This of course has nothing to do with the usefulness of green manuring. (*Ed.*)

Some Agricultural Problems of the Hassan District.*

By

Dr. Leslie C. Coleman, M.A., Ph.D.,

Director of Agriculture in Mysore.

The reports of work done during the past year in the Hassan district in connection with agricultural improvement and veterinary aid which will be read here to-day give clear evidence of progress. I shall not anticipate these reports but shall confine myself to a few of the problems and activities which I consider of special importance to this district.

You will, I am sure, pardon me if, before entering upon the more serious portion of my address, I claim the privilege accorded to one who has passed life's meridian and spend a few moments in reminiscence. It is now almost exactly twenty-two years since I paid my first visit to this district at the beginning of my first tour in Mysore. At that time the Agricultural Department was represented by what was known as the minor Department of Agricultural Chemistry. There was no district staff whatever in this or any other district in the State and I think it is safe to say that the great majority of agriculturists in this district were quite unaware of the existence of any special agency in the State for the improvement of agricultural conditions. I well remember the then Deputy Commissioner of Hassan expressing to me in no uncertain terms the view that there was very little hope of making any appreciable change in the age old methods of Mysore agriculture.

Twenty-two years is a very short period in the life of a people and I do not for a moment claim that we have been able to revolutionize agricultural practices in that time. I believe, however, that the attitude of the people of this district and elsewhere in Mysore in connection with the question of agricultural improvement has very greatly altered. In bringing about this change of attitude the Mysore Department of Agriculture has played no small part. If, however, we had not been able to obtain the co-operation of the revenue officers, the district board and the leaders of the people in general, we should have been able to do but little. I wish to express on behalf of the

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* Address to the District Agricultural Conference.

departments under my control, my very deep appreciation of that co-operation.

The agricultural features of this district are more varied than those of almost any other district in the State. In the extreme west we have areas with a rainfall between 60 and 300 inches per annum where, in addition to paddy, the typical planters' crops—coffee, cardamom and tea—are being grown. Farther east lies a belt on which the so-called *kar* crops are found and still farther east we have an area comprising the taluks of Holenarasipur, Channarayapatna and Arsikere where *hain* crops prevail. Both these latter areas possess considerable acreages under sugarcane, while the channel areas of Arkalgud and Holenarasipur present special agricultural problems. Lastly we have in Arsikere taluk considerable areas of cotton and cocoanuts with a possibility for future expansion.

All these varied agricultural conditions require a diversity of effort on experiment and demonstration which is at present far beyond our reach with the finances at the disposal of the Agricultural Department. Nevertheless the last few years have shown a marked expansion of the activities which are calculated to improve agricultural conditions in this district.

Among these I must mention, in the first instance, the work of the Coffee Experiment Station. While this station is situated in the neighbouring district of Kadur, its work is likely to be of just as great importance to this district. Hassan district has two representatives on the Advisory Board of the station, Messrs. Haji Mahomed Hussain and E. H. Young and these gentlemen have taken very great interest in the development of work on the station.

As you are probably aware the work of the station has to do mainly with three lines of investigation. Firstly, we have the investigation of the diseases and pests of coffee with the definite object of bringing them under control; secondly, the investigation of the manurial requirements of coffee ; and thirdly, the breeding of new varieties for yield, quality and disease resistance. Work is progressing steadily along all these lines. I believe that the very marked increase on spraying for the control of coffee diseases more especially among Indian planters is the result of the work of our station and staff. While it will probably be some time before we shall have new coffee varieties

available for distribution the advice of the Department in connection with the manuring of coffee is being sought to a steadily increasing extent. The work of this station will, I am convinced, increase in value and importance with every added year of its existence.

The second recent feature of departmental activity which is likely to affect agricultural development in this district is the establishment of an Experiment Station for *kar* crops at Hunsur. Work has already been begun there on the selection of *kar* ragi and I anticipate within comparatively short period that we shall be able to supply the *kar* areas of this district with improved strains which will yield very considerably more than the mixtures now being grown. As regards the *hain* areas we have recently taken up the question of supplying pure seed of our best *hain* ragi selections through the establishment of private seed farms at Hiresave in Channarayapatna taluk and at Arsikere. It is proposed to use these seed farms as centres from which a regular supply of pure seed will be available for the district.

If we turn to the question of live-stock improvement we have in the organization of a cattle farm near Ajjampur an agency which is certain to benefit greatly this dis rict. When I tell you that we have already on the station over fifty selected young bulls which are available for distribution you will see that no time has been lost in making this station of practical use to Mysore ryots. It is planned to raise the annual number of bulls available to 200 within the next five years. Plans are also under way towards the organization of the sheep industry in your grazing taluks.

In this connection I must not neglect to mention the organization of veterinary relief which has progressed farther in this district than in any other. You have now a veterinary dispensary in every taluk, and while I am quite aware that you are not satisfied and are pressing for the establishment of a veterinary dispensary in Alur sub-taluk as well I think you may congratulate yourselves on the progress that has already been accomplished. With the organization now existing in the district it should be possible to keep your most serious cattle diseases under control.

Lastly, we have the establishment of an agricultural school very largely through the efforts of the district board and its able president Rao Bahadur N. S. Nanjundayya. It is perhaps still too early to

predict the results that will accrue from this experiment in agricultural education, still I believe that the school will serve a useful function in the development of agriculture in the district.

The organization of agricultural demonstration work in Hassan district while in no way behind that in other districts is still insufficient. You have now 4 agricultural inspectors and 6 fieldmen. I shall not be satisfied until there are at least one agricultural inspector and two fieldmen for each taluk. While there is marked evidence of progress in the introduction of improved seed and commercial fertilizers I am by no means satisfied with the comparatively slow rate of progress in the introduction of improved implements. I am aware that rapid progress in this regard will have to go hand in hand with the improvement of our draught cattle. However, the sale of only 88 improved ploughs in the district while a marked improvement over the previous year's total of 29 is still much too low. In this connection I feel we must utilize the services of co-operative societies and village panchayets to a much greater extent than we have in the past. I can see no reason why every village panchayet in this district should not possess at least one improved plough, which can be used for demonstration and hiring purposes. This would do away with all necessity for the transport of demonstration ploughs from place to place with its attendant expense and would, I feel certain, lead to a much more rapid increase in the use of these important implements.

This brings me to the general question of the organization of village improvement a subject on which much has been said and written during the past three or four years. Under orders of Government I very recently visited Gurgaon in the Punjab and while my stay there was very short, through local and general enquiry and through the inspection of several villages I was able to gain some idea of the uplift work that had been attempted and accomplished there.

One thing seemed quite evident and that is the results that have been achieved in Gurgaon district are almost entirely due to the ability and enthusiasm of Mr. and Mrs. Brayne. That these two made a very deep impression on those with whom they came directly into contact seems certain. It seems equally certain that they must have had at their disposal very considerable sums of money. I visited Gurgaon about two years after their departure and I found a very

general consensus of opinion among those with whom I conversed that there had been very little progress since their departure. I may say that my conversation was with non-officials who were enthusiastic admirers of Mr. and Mrs. Brayne and who had been their ardent supporters, so there could, I think, be no question of any attempt to detract from the value of their work. It is only fair to state that the district had passed through three years of severe scarcity, a condition hardly favourable for village uplift. Further more, there have been three changes of deputy commissioners in the course of the last two years so that conditions could hardly be considered favourable for continuity of policy.

This is not the place for me to discuss in detail the results of my enquiry. I may say, however, that my visit strengthened me in the view I have already expressed that we have already all the machinery that should be required for village improvement. The revenue organization, the district board, the village panchayets, the co-operative societies and the local organizations of the various development departments, Education, Medical, Sanitary, Co-operation, Industries and Commerce, and Agriculture are all devoting much if not most of their attention to work which has,as its goal,the improvement of village conditions. As time goes on, more and more responsibility for the improvement of these conditions will, I believe, have to be placed on the district board. Speaking only for the departments with which I am associated, I have felt for some time that our work would gain in effectiveness were the district board to take a greater part in its organization and control. It is for this reason that I have recently recommended the transfer of control of your Agricultural School entirely to the District Board and I trust it will be found possible in the not distant future to bring about a closer association between the Agricultural Department and the District Board in our other agricultural activities.

NOTES AND COMMENTS.

Topping of Coffee.

With reference to an abstract on the subject which appeared in Vol. X, No. 3, of this Journal, Mr. C. K. Appachu writes as follows :

"An article on the above appeared in the *Journal of the Mysore Agricultural and Experimental Union*, Vol. X, No. 3. It was interesting to see the difference in the yields of topped and untopped and pruned and unpruned coffee.

No doubt in some coffee growing centres very satisfactory yields were obtained without any pruning while in other centres, without pruning, the average crop could not be obtained. Therefore I think, the topping and not-topping, pruning and not-pruning depend entirely on soil conditions, climatic conditions and elevation of coffee growing areas."

The article giving as it does the results of work in Porto Rico certainly does not give information which can be directly applied to Mysore conditions. However it does suggest a line of investigation here which might be taken up on a small scale by coffee planters. I imagine that very few planters would be prepared to allow their coffee to grow up into trees without topping more especially in view of the increasing interest in and importance of spraying. However it is possible that a system of topping somewhat higher than that now practised might be advantageous. The question of pruning *versus* non-pruning is certainly one which could be investigated on our Coffee Station.

L. C. C.

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Our Annual Field Day (1929).

One of the drawbacks of holding the annual meeting of the Union in November every year has been that the results of the year's experiments are not then ready for discussion. But early November is about the best time to visit the Hebbal Farm. In order that members may have an opportunity of acquainting themselves with the experiments, the last day of the annual meeting is spent on the Hebbal Farm. The

combination of the field day with the annual meeting has been not a little helpful in the past in attracting a large number of members to the meeting.

But, as has been stated above, one of the most important functions of the meeting, *viz.*, the discussion of the results of the year's work, cannot be fulfilled as the results are not then available. This function of the general meeting was considered so important that some years ago it was decided that a special general meeting be held in April or May to enable the results to be discussed. This special meeting was held in May 1922 but hardly a dozen members attended it. The November meeting combined with the field day was thereafter resumed. But the question came up again for discussion at the annual meeting in November 1928 as our members are aware, and it was decided that, as an experiment, the field day may be held in November as usual, the annual meeting being held some time in April or May about the time of the Departmental Conference. The field day was therefore held on the 29th November 1929 on the Hebbal Farm. The Committee had decided that the field day should be arranged on the Nagenahalli Paddy Breeding Station but for various reasons it was found that Nagenahalli was not suitable for this year (1929).

A consideration in favour of holding the field day on the Hebbal Farm has been the show of calves born to the breeding bull maintained on the Farm and the cows in villages round about Hebbal. This show is held on the date of our field day and adds considerably to its attractiveness. The show which began in a very humble manner in 1923 has grown gradually in proportions and is now almost a small cattle fair. In 1923, the show was held in connection with our field day. Being the first time, only 27 calves had been exhibited. There was however clear evidence, to all who saw, of the influence of a good bull on the progeny. For various reasons no show was held during the succeeding four years.

The second show was held, again in connection with our annual field day, on the 23rd November 1928. This was a great success. The total number of calves exhibited were 124. They came from 18 villages and 91 persons competed for the prizes. The competing animals were divided into six classes.

1.	Two year old	..	Bull calves.
2.	,,	..	Heifers.
3.	Yearling	..	Bull calves.
4.	,,	..	Heifers.
5.	Baby	..	Bull calves.
6.	,,	..	Heifers.

Silver medals and other prizes were awarded to the prize animals. The prizes were kindly distributed by Srimati D. Sakamma, Coffee Planter, a member of the Committee of the Union.

The third show was held on the 29th November 1929 in connection with our field day. Altogether 167 animals belonging to 63 exhibitors from Hebbal and surrounding villages, were brought for competition. As there was rinderpest prevailing a month previous to the show at Kodigehalli, a village two miles from Hebbal, and the cattle had not been protected, the villagers were not allowed to bring their animals to the show.

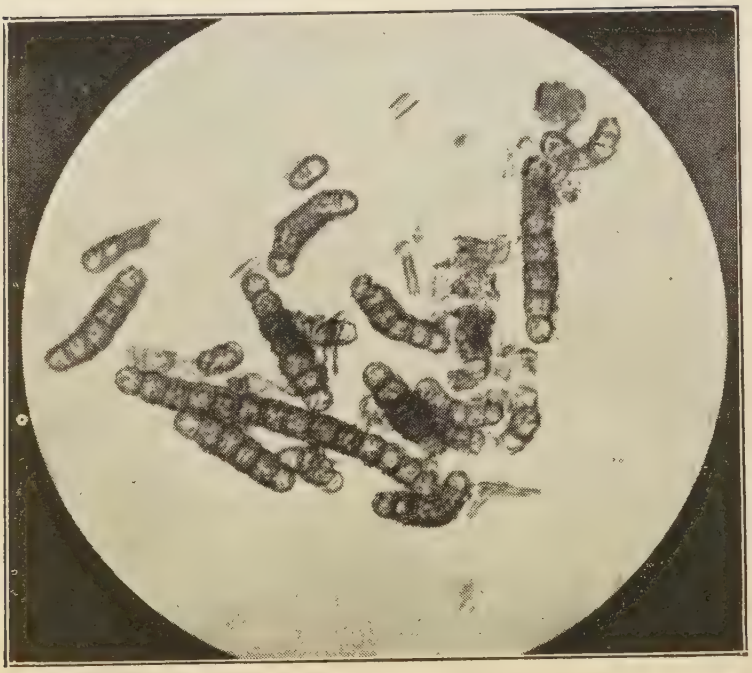
Srimati Sakamma was so impressed with the show of the previous year that she offered a gold medal for the best live-stock exhibit at this show. There was very keen competition in class III yearling calves. Mr. W. Smith, the Imperial Dairy Expert, associated with three members of the Union and the Superintendent, Amrut Mahal Department, very kindly acted as the chief judge.

The coveted gold medal so generously offered by Srimati Sakamma was won by Mr. Mahomed Gouse's three year old heifer. Mr. Smith's special prize of Rs. 10 was awarded to a yearling bull calf owned by Munisamy of Narayanapura.

Mr. Badami Krishna Rao kindly distributed the prizes to the winners and in a neat little speech specially addressed to the exhibitors, laid particular stress on the importance of raising cattle of good quality.

Another attractive feature of the field day was the show of select exhibits of departmental work by the Agricultural Department—a miniature Dasara Exhibition as it were, but confined to agriculture.

This year's field day was attended by a good number of our members. The sale of surplus stock of the Hebbal Dairy which came off on the same day, was taken advantage of by some of our members. They were impressed greatly with the crops they saw in spite of a very unfavourable season. A sort of a combined handbook and



Microphotograph of the Spores of Heterosporium on Stored Ragi. X 250.

guide to the farm plots which gave the results of various experiments conducted on the farm in previous years was specially prepared for the occasion and placed in the hands of visitors. The book was much appreciated by the members and has been published as a supplement in a previous issue of this Journal.

Special thanks for the success of the field day are due to Mr. Gundappa S. Kurpad for arranging for the comforts of members and to Mr. C. Narasinga Raju for the enthusiasm and energy with which he got up the show of calves which is a unique kind of show in this country. The students of the Agricultural School, as usual, rendered service in connection with the dinner. (N. V. S.)

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Ragi (*Eleusine coracana*) **Stored in Underground Pits.**

Since many years ago the attention of the medical profession has been drawn to the peculiar intestinal disorders of persons consuming old *ragi* stored in *hagevs*. A large number of cases have been reported by Dr. S. Subba Rao, Senior Surgeon, of persons suffering from vomitting and purging as a result of consuming old *ragi*.

As is well known, *ragi* is stored in *hagevs* which leave much to be desired in the way of sanitation. The layers of *ragi* which are in contact with earth in the *hagevs* get spoilt in the same way that fodder gets mouldy when stored in a silo pit along its sides and bottom. In wet weather, the *hagevs* will serve as a moist chamber conducive to the growth of organisms.

The affected *ragi* turns black in colour, with pustular outgrowths on the surface. During the early stages of attack, the grains have a greyish white covering. Free hand sections of the affected grain showed the presence of a brownish mycelium, with long septate spores. The outermost layer of the seed often had black sclerotia-like bodies from which the spores emerge.

Cultural characteristics.—Pure cultures were easily made on potato dextose agar, oat agar, and *ragi* agar. The mycelial growth is rich black in colour, though during the early stages it appears slightly greenish at the edges. Examined under the microscope, the mycelium is septate, deep brown in the older portions and hyaline in portions towards the tip. Spores are profusely formed on oat agar and *ragi* agar. The hyphal tip rounds itself and a long spore

with varying number of septa develops on it. Spores with 5 to 6 septa are the commonest to meet with, but often we see long chain-like spores with as many as 16 septa. The wall of the spore is thick brown, and studded with wart-like outgrowths, a characteristic feature of the genus Heterosporium. Cultures were also made on *ragi* grains. A flask containing healthy *ragi* was sterilized and inoculated with the fungus. The spread of the fungus was rather slow, but the entire contents of the flask was affected in the course of a month's time and easily crumbled into a dark powder.

The fungus Heterosporium has been known in other parts of the world to be a parasite on various living plants, but has never been reported on stored grains. Until further work is done, it is hard to estimate the role of this fungus in causing intestinal disorders. In addition to this fungus, I was able to make out the occasional occurrence of a large round spore-like body which however has not been found in such abundance as the spores of Heterosporium. In samples examined thus far I have always found a Gram positive bacteria, which requires further investigation. Whatever the nature of the organism is, it must either be able to withstand the boiling involved in the preparation of the *Hittu* (*ragi* flour boiled into a paste with water) or it may be secreting a toxic substance. The spores of Heterosporium do not survive twenty minutes' boiling. Cases of similar intestinal disorders have been known, produced by the consumption of old wheat flour. It is interesting to note that feeding experiments on poultry and pigs, conducted with scabby barley in Iowa, U.S.A., have shown that the affected grains contain some sort of emetic substance, the active substance being associated with the fractions containing glucoside or basic nitrogen compounds. The grains were found to be affected by a fungus (*Gibberella saubinetii*). Pigs when fed on such grains developed nausea for food attendant with vomitting and lost weight, while chicks fed on clean barley showed increase in weight.

It rests with those concerned to make a thorough study of the poisonous substances contained in affected *ragi*. I wish to acknowledge my indebtedness to Dr. S. Subba Rao for providing me with samples of affected *ragi* and his kind interest in my work.

M. J. Narasimhan.

SELECTIONS.

How Pasteur Discovered Bacillary Vaccination.

While vaccination against small-pox was practised by Jenner in 1798, it was not until Pasteur immunized chickens against cholera in 1865 that artificial immunization against contagious diseases was actually born. The process was discovered somewhat accidentally when Pasteur discovered that while old cultures of the cholera bacillus which he had set aside in the corner of his laboratory accidentally for several months, would make chickens sick, it did not kill them like freshly prepared cultures. He then discovered, also quite accidentally, that the chickens which had received the old cultures survived his injections of fresh (virulent) cultures. Alas, they were immune like the human recipients of Jenner's vaccine! Attenuated bacillary cultures had built up an immunity against virulent cultures!

With this hypothesis tested and proved beyond question of doubt and the conception of heat as a means of attenuating the cultures in lieu of ageing, the discovery of anthrax vaccination was merely a matter of routine laboratory work. In other words, from these hints it was but a short step to the use of the principle of attenuation in other diseases already known to be of bacillary origin.—*The North American Veterinarian*, Vol. 10, No. 9.

Means of Obtaining Reliable Seed.

The following extracts are made from Circular 52 *of the U.S.A. Department of Agriculture* :—

Because of the present difficulties in the way of procuring seed, true to name, it is better for the grower so far as possible to select the seed heads of the varieties he wishes to grow from plants standing in the field. In this way, seed can be obtained from plants which are true to type, and selections can also be made with a view to improving the strain. When the grower is selecting his own seed, precaution should be taken against getting seed from plants that have been pollinated by types other than the one it is desired to grow. It is possible by this practice for growers and for seedsmen to obtain seed

that is of higher grade and purer and that will perpetuate itself truer to type than ordinary commercial seed. Consistent selection of seed of desirable types from fields of superior or promising varieties made at the time when the heads are about to mature will furnish seed which will give far better returns than non-descript commercial seed. In such selection the grower should take into consideration not only the head characters but also the size, habit, and general vigour of the plant. This selection will not insure absolute purity of the seed in all cases for pollen from other varieties or even from some of the grain sorghums or from Johnson grass or broomcorn may have been carried by the wind and caused contamination either in the current season or in a previous one; but if the heads are taken from the interior of the field, the possibility of contamination by undesired pollination will be slight unless the field contains a considerable admixture of other varieties.

The effect of cross-pollination is not evident in the crop of the season in which the crossing occurs. It will, however, cause a difference in the appearance of the plants of the succeeding crop, which as a result of the crossing would show a tendency to be more vigorous and would very likely show minor differences in colour and in the form of the head and floral parts. When these differences which arise as a result of hybridization are known the off-types can be avoided, and in making the selections the heads should always be carefully scrutinized so as to insure the selection of plants typical of the desired variety. As there is usually more than one point of difference in every distinct race or variety, undesired types can be discarded. As the result of following for a number of years this practice of seed selection, the variety will become essentially pure. It is ordinarily not necessary to magnify the parts of the head in order to be able to discriminate between the different heads sufficiently well to make selections of this kind.

The saving of seed of superior varieties is thus the surest way of obtaining high-grade sorgo seed. Unfortunately, however, uniform fields of the best varieties are not always available for making the selections, in which case recourse must be had to neighbouring fields or to fields in other localities.

For this reason, it is highly desirable that the standardization of the names of the principal varieties, at least, be established by descriptions extensive enough to permit them to be determined so as to enable growers to procure seed with some assurance as to identity.

Chemical and Microbiological Principles Underlying the Transformation of Organic Matter in Stable Manures in the Soil.

By Selman A. Waksman and Robert A. Diehm.

We extract the following from an article published in the *Journal of the American Society of Agronomy*, Vol. 21, No. 8:—

The nature of the problems involved in the decomposition of organic matter in stable manure, whether this is first composted or applied directly to the soil, presents certain specific differences from those involved in the decomposition of green manures or in the preparation of artificial manures.

First of all, the very nature of the chemical complexes after they have gone through the digestive tract of animals has become materially modified. The animals, either through the action of their digestive enzymes or through the agency of bacteria living in their digestive tracts, have consumed all the sugars and starches and a large part of the fats, pentosans and celluloses. The manure has become enriched in lignins and in proteins.

Secondly, the nature of the nitrogenous compounds is quite distinctly different from that of similar compounds in the other organic manures previously considered. As a result of the digestive processes in the animals, practically a half of the nitrogen is excreted in an available or readily available form. If this nitrogen is not immediately used by plants, it may be rapidly lost unless other measures are taken for its preservation.

These problems can be briefly summarized as follows:—

Manure is a product resulting from the digestion by animals of feed materials largely of plant and some of animal origin. The digestion of the complex organic materials in the feeds involves a diminution of sugars, starches, fats, pentosans and celluloses, and an increase of the lignins. The nitrogen is excreted by the animal partly in a soluble form, as urea and ammonium carbonate, and partly in a complex organic form, some of which is made up of bodies of micro-organisms.

In the decomposition of manure, the pentosans and celluloses are reduced much more rapidly than the total organic matter, while the lignins are decomposed less rapidly, hence there is a rapid reduction of the polysaccharides and an accumulation of the lignins.

Only the soluble nitrogen undergoes rapid nitrification in the soil. When the decomposition of the organic matter begins, a part of the soluble nitrogen is changed by the micro-organisms into a complex

organic form. Both forms of organic nitrogen, namely, that present originally in the manure and that synthesized by the micro-organisms in the composting of the manure, become only slowly available.

The role of micro-organisms in the transformation of manure can be summarized under the processes of decomposition and synthesis both of which take place side by side. From the most readily decomposable sugars to the most resistant lignins all the organic complexes in the manure are acted upon by micro-organisms in the decomposition of the manure. Parallel with the decomposition processes, the micro-organisms synthesize considerable cell substance, as evidenced by the increase in the protein content, which may form a large part of the actual manure after it has been composted.

Cocoanut Cultivation.

By Prof. J. Sydney Dash.

Figures available on the cocoanut industry in the Colony show that a considerable expansion is taking place in this crop. Unfortunately, after seeing a number of the cocoanut areas, one is led to the general conclusion that the trees in most instances are not thriving. Many of these have been established on unsuitable soil with inadequate drainage and with scarcely any attention to cultivation. On light soils, it is true, the trees are growing under conditions that enable them to resist cultural neglect remarkably well. Now it is a recognized fact that while the palm, generally speaking, is of a robust nature, it should be borne in mind that in unfavourable environment the trees will come into bearing late and are relatively short-lived. For such trees to remain healthy and vigorous, considerable expense is necessary for maintenance and cultivation, whereas, normally, on soils and under conditions suited to their growth the palms fruit early and maintain productivity for a long period of years at a minimum expenditure for care and management.

Thus, in view of what has been stated, it seems clear that a note of warning is necessary at the present time in order to prevent any setbacks to a promising industry and that its permanency may not be in any way jeopardized, through haphazard methods or, still worse, no method at all.

A rough calculation obtained by equating copra and oil to nuts on the basis of the 1928 figures indicates, after making necessary allowances, that the average yield per tree was hardly more than fifteen

nuts. This is extremely low and supports the contention that all is not well with the industry agriculturally. Growers should not be satisfied until the average production per tree can be brought up to at least fifty nuts. This means that care will have to be exercised in the development of new areas and in the improvement of those already established. In the first place, I would urge greater attention to the question of selection of seed nuts, the main points concerning which are fairly well known, but often not acted upon. Further selection is necessary in the nursery, young palms showing any signs of feebleness being rigidly rejected for transplanting.

Then there is the question of giving the young trees a good start. Apparently no one in this Colony ever thinks that a cocoanut palm needs manure. In this connection, the proper time to commence to apply fertilizer is when the seedlings are transferred from the nursery to the field. This is a critical period as, by this time, the plant has ceased to get nourishment from the reserves in the nut and, moreover, the severing of young roots and the actual operation of transplanting constitutes a check which can best be remedied by the application of a little quick acting fertilizer when the plants are set in the field. A mixture which has been recommended with success in other countries is as follows :—

150 lbs. superphosphate.
150 lbs. nitrate of soda.
50 lbs. muriate of potash.

This should be well mixed and 2 lbs. of the mixture thoroughly incorporated with the surface soil in each hole. That it pays to manure cocoanuts has been repeatedly demonstrated.

After the palms have been established it may be necessary to give another application, but the essential point is that the transplanted palms be given a good start. As soon as fruiting commences the question of replacing soil losses due to cropping should be carefully considered. In this connection the writer published the following in *Tropical Agriculture*, July 1926, p. 143 :—

"The drain of plant food from the soil as a result of cocoanut cropping is not often sufficiently realized. In the West Indies, calculating on a basis of seven thousand nuts per ton of copra, seventy trees per acre, and fifty nuts per tree per annum, it will be found that one ton of copra should be produced from about two acres. This means an annual loss per acre, expressed in pounds approximately, of potash 37.73, phosphoric acid 6.11, and nitrogen 52.78. These figures take into

account the constituents in husk, shell, meat and water. The losses mentioned may be considerably diminished according to the methods of harvesting and disposal adopted. For example, if the nuts are split where they are collected, the water, rich in potash, would be returned to the soil. In the case of husk, shell and fallen leaves, it not infrequently happens that these are burnt away from the fields with the consequent loss of all fertilizing ingredients. Where the ashes are collected and returned to the plantation, the potash and phosphoric acid are recovered, but the nitrogen is lost. There is also the fact to be mentioned that burning such material inside the groves may do considerable harm to the root system of the palms and to the young spathes, resulting in the shedding of flowers and immature nuts from the latter. Losses are reduced to a minimum when all plantation refuse is left to decay in the fields producing it. This refers to general estate practice and obviously will not apply to cases of specific disease where it may be essential to destroy infectious materials *in situ*."

Space does not permit any lengthy treatment of the question of tillage and cultivation. The amount required will depend largely on the environment, the policy adopted in respect to management and the usual economic considerations; but, under any circumstances, an effort should be made to free the soil periodically of weeds and grass for some distance around the growing palms, especially if the full effect of manuring is to be obtained. The practice of grazing in young cocoanut cultivations is to be deprecated.

At present the Department is handicapped by lack of suitable land for studying agronomic problems in relation to this crop, but it is hoped that before very long this situation will be remedied and sufficient area obtained for definite work to be planned with a view to throwing light on the cultural requirements of the palm under local conditions.—*The Agricultural Journal of British Guiana.*

Establishment and the Work of the Farm Experiment Circles in Germany.

The institution known as Experiment Circles (*Versuchsringe*) is one of considerable importance for farm advisory work, for progress in technique and in farming organization in German agriculture. The first of these were founded in the Province of Saxony eight years ago. The institution had its origin in the idea of self-help. A number of large farms decided on carrying out field trials in common; a farmer thoroughly qualified on the technical and scientific side was appointed on a full-time basis as Director of the experiments, and the cost incurred

was shared on the basis of a unit of area. The trials were in the first instance to have a practical aim and the outcome was to be in practice a utilization of the technical and scientific experience gained. Any trials especially desired by individual farms were carried out on the farms themselves; the plan, lay-out, and also the results were discussed by the farmers with the director. Much was accomplished by regular conferences of the directors and accompanying exchange of views. The institution of the Experiment Circles did not imply any sweeping away of the earlier organization of experimental work; the intention was merely to fill a gap which was becoming more and more apparent and the claims on experimental work were becoming greater. The experimental system as previously organized, owing to its limited resources, was not in the position to carry through so comprehensive a number of trials as are now-a-days required nor to give consideration to the lay-out of the experiments in accordance with special desires. In view of the progress made by agriculture in the regions mentioned, anxiety was shown to go on to systematic trials in regard to fertilizers, seeds, questions of working the soil, etc. It was hoped to achieve better standpoints than were reached by the results of previous trials carried out on other farms and in differing circumstances which, owing to the marked differences occurring in natural and economic conditions, could often only to a limited extent offer grounds for argument. From the beginning onwards very great value was attached to the collaboration and the exchange of views and experiences with scientific institutions. This was to the advantage of both sides, and the transition path from theory to practice was shortened.

The earlier experiment circles included large farms only, and the area dealt with by a circle varied from 3,000 to 7,000 hectares. The results achieved were the more remarkable as the farms belonging to the circle were hardly ever surpassed in respect of size and intensity of yield and general excellence of farm management. It was thus rightly felt that if the result was favourable in the case of these farms, it was sure to be so in the case of other farms, and hence the number of circles soon became greater. The latest list of the circles issued by the German Agricultural Society (Deutsche Landwirtschafts-Gesellschaft) gave the number as over 600, and this number must by now be much larger.

As the idea of the experiment circles gained ground the organization of the circles underwent certain changes. The self-supporting principle which was originally strongly emphasized could not be completely maintained. Apart from subsidies from public resources it would have

been impossible to achieve any extension of the scheme or to establish the circles on any large scale in farming districts (Bezirke). In contradistinction to the self-supporting circles, which group only a limited number of large farms and have a director who gives his full time to the work, the farming experiment circles frequently embrace whole districts (Bezirke) and are attached to the School of Agriculture situated within the district. This connection with the School of Agriculture partially solves the question of the financing, the teachers of agriculture undertake to do the work of the experiment circles and the additional costs are met by subsidies from the Reich and from the State and communal authorities.

The principal activity of the circles remains the work of experiment: trials of soil cultivation, fertilizing, varieties, seed germination and control of pests. The importance of this experimental activity is clear from the consideration of a single fact. If it is remembered that fifty trials are carried out by one circle alone, with 600 circles the figure of 30,000 trials in farming practice is reached already. The progress thus involved for many parts of the country is apparent from the comparison of the trials in certain parts carried out before and after the extension of the experimental work. Trials were carried out as follows:

	In Baden	In East Prussia
1913	About 50	About 50
1920	„ 160	„ 100
1924	„ 173	„ 500
1927	„ 1,946	„ 3,236
1928	„ 180	„ 3

The earlier number was thus in 1927 multiplied from 20 to 60 times and in 1928 for Baden 60 times. It is, however, rightly pointed out that a simple comparison between previous years and the present is not practicable, since previously the experiments made were mainly for show, whereas the present-day trials are chiefly exact trials. The exact performance of all trials would involve unnecessary labour in many farming districts where the first essential is to apply what has been proved of value on other farms. The work in the farming circles will be of a different type from that in the independent circles, and the farming circles will usually try from the first to go further and to embrace the whole farm. Actually the independent circles do not confine themselves merely to the field trial's work although that is their main activity; many circles have gone beyond their original function as unions for supervision of crop lands and have extended their activity also

to other branches of farming (stock breeding, pasture land, etc.) and engage in questions of farm organization and management. The experiment circles of the larger farms hold, as a matter of course, joint conference on the results of trials and on field observation visits, but in the farming districts a still greater importance attaches to these. The tenacity with which many farmers hold to traditional methods makes it hard to win them over by words alone to any progressive step, and they will be more inclined to admit that the innovators are right if they are actually shown on the spot the defects in the old methods, the success of a sound method of cultivation, fertilizing and selection of varieties, or the satisfactory and successful working of a new implement or a new machine. The final aim of the farming experiment circles is thus the formation of a general comprehensive farm advisory service. For this reason it was expedient to form a closer connection with the existing agricultural advisory centres and the agricultural schools, whereby these two types of institution also profited. The system of farming experiment circles and agricultural instruction are by their very nature closely connected, and for the attainment of a complete result they must supplement each other. The idea of the farming experiment circle and its linking with the school thus viewed contains nothing new, but is an up-to-date intensification and rationalization as well as an establishment of a permanent arrangement due to the sound working of the experiment circles and their responsibility to well-known large farms. In conclusion one point may still be emphasized. In many districts the work of the circle is extended to the question of pasture-land which except in a few progressive districts has not received the same attention as arable land. In order to begin at the foundations in this activity, many circles lay out, in conjunction with the pasturage unions where such exist, demonstration grass plots alongside of the plots for trial of varieties, and here good and poor grasses, forage plants and weeds are grown side by side. The farmers then see which grasses and herbs they actually have on their meadows and pastures and which they ought to have in given circumstances.

In the provinces the Experiment Circles have formed themselves into labour unions. The function of these unions is to give effective support to the individual circles, by advice, supply of information, exchange of views, prevention of overlapping, unification of experimental technique and of the application of the trials, lightening and prefecting of the work by courses of instruction for the directors, widening the scope of the work of the whole organization by new initiatives and facilitating these by means of the collective experience. The German

Agricultural Society has given close attention to the activity of the experiment circles and, by means of its special Committee and by the joint work for the experiment circles as a whole, has done much to define the functions and organization of the circles, and for their further development. (H. B. L.)—*International Review of Agriculture*, Year XX, No. 9, Part II.

Features of Well Made Cattle Manure.

[*The following paragraphs are extracted from an article entitled "Cotton Research Work and its relation to the work of the Agricultural Department," by Mr. G. R. Hilson, B.Sc.*]

In an old and well-established system of agriculture, such as prevails over the greater part of this Presidency one of the greatest barriers to good farming that can exist is the failure to produce annually a reasonably adequate supply of good, well made cattle manure. The salient features of well made cattle manure which are of interest to the cultivators of this Presidency and which have been well tested or concerning the truth of which evidence is accumulated are :—

(1) It improves the texture of the soil, *i.e.*, it makes the soil easier to work and more permeable to moisture.

(2) It improves the capacity of the soil for retaining the moisture and certain plant foods.

(3) It improves the yield of crops.

(4) It apparently improves the feeding quality of cereal crops grown on land to which it has been applied.

(5) It apparently affects the seed of a crop grown on land to which it has been applied, in such a way, that this seed when sown, develops into a healthier and more vigorous seedling than is the case with seed from a crop grown without the aid of cattle manure.

(6) In certain cases, it apparently must be applied to the land if satisfactory results from the application of artificial manure is to be obtained.

It is therefore clear that the correct handling of cattle manure lies at the very foundation of good farming.

In this Presidency, speaking generally, the amount of cattle manure available is well below requirements and its quality is of the poorest. If, therefore, the cultivators, as a body, could be persuaded to take steps to remedy these two defects in their cattle manure supply, a long stride would have been taken towards making agriculture a more profitable

industry than it is at present. I have used the word "persuaded" advisedly. There are very few cultivators who are so careful and so efficient in the preparation of their cattle manure that they could not make some alteration in procedure with advantage and of the others there is none who possesses cattle who could not do something to improve their position. Fortunately in this case the procedure to be adopted in improving the quality of the manure leads to an increase in quantity. This is in marked contrast to the position found in the case of crops, where efforts to improve quality usually automatically bring in their train a reduction in yield. That it does lie within the power of every cultivator who keeps cattle to improve his supply of cattle manure both in quantity and quality will become apparent from a consideration of the details of the process of manufacture of good cattle manure.

In the manufacture of cattle manure of good quality, three ingredients are needed : (*a*) dung, (*b*) urine, (*c*) litter. The action which takes place when these three ingredients are brought together under the right conditions may be briefly described in this way. Bacteria and fungi of which large numbers are present in the dung and in the litter draw upon the nitrogenous compounds supplied in the urine for their development. In so doing they cause the nitrogen to pass through certain changes with the result that from being present in a form in which it might readily be lost, it takes on a more stable form. Incidentally the woody matter of the dung and the litter, which goes to form humus in the soil on which the beneficial effects of cattle manure largely depend, is brought into a mechanical condition which renders it easy of incorporation in the soil. In the presence of a sufficient quantity of litter the loss of nitrogen is small. With insufficient litter the nitrogen of the urine escapes in the form of ammonia, as can be readily recognized by the smell. The best method of preparing cattle manure is to house the cattle in a stall with a hard floor, allowing each animal a fair amount of freedom of movement so that it does not always urinate in exactly the same spot. On the floor of this stall litter should be spread and each day the droppings should be scattered evenly over the litter and a fresh layer of litter supplied for the cattle to lie on. If the litter is very dry, a sprinkling of water should be given at intervals before the new layer of litter is spread in the stall. At longer or shorter intervals according to the size and depth of the stall the manure should be removed to a pit and covered with earth. There it should stay until required for use. Thus, granted that the cultivator possesses cattle, his supply of the two of the ingredients is assured. All he needs is a sufficient quantity of litter to aid him in the conservation of the valuable nitrogen of the urine

and to supply woody matter for the formation of humus. It is precisely at this point that the root of the trouble becomes evident.

The average cultivator, the man with a pair of working bullocks, a cow or two and a she-buffalo is usually insufficiently provided with fodder to feed all his animals properly. Further he is usually of the opinion that he cannot afford to purchase fuel. The procedure he follows is therefore this. He feeds his fodder first to his work cattle. What they leave he passes on to his cows or buffaloes and what they refuse he uses as fuel. In addition he usually makes no attempt to collect the urine his animals excrete. He is however usually more careful of the dung, which he collects daily and consigns to the heap in which he puts his ashes and sweepings. Fortunately the dung dries quickly and therefore suffers little change before it finds its way to the land.

This procedure suffers from three grave defects :—

(*a*) The number of stock kept is greater than the supply of fodder warrants.

(*b*) The refuse fodder is burnt.

(*c*) The liquid portion of the excreta is allowed to run to waste.

Consider these three points in turn.

(*a*) The usual argument offered in support of this position is that the animals which are in excess of the number required for work are kept for their manure. Were it the case that the liquid and solid excreta of these animals were used in rotting down quantities of litter this argument would carry some weight. As this is not the case the practice is indefensible. In the first place the quantity of manure obtained does not depend solely on the number of cattle kept. It depends also on the quantity of fodder fed. For example, suppose the amount of fodder on hand is sufficient to allow of four animals being fed at the rate of 15 lbs. of fodder per head per day. If six animals are kept the quantity of fodder fed daily to each animal will have to be reduced to 10 lbs. if the supply is to last an equal length of time. The amount of manure produced in each case is the same.

Secondly, animals which are kept in a continuous state of semi-starvation are (*a*) of low values, (*b*) produce progeny which are of low value, (*c*) do not breed regularly, (*d*) when in milk do not produce sufficient milk to feed the calf and supply a reasonable surplus for household use, (*e*) are more liable to succumb to disease if attacked than animals properly fed. They are therefore less profitable to keep than animals which can be fed properly. Here it may be remarked in passing that as in the case of cattle manure the quantity of good cow's milk produced is a long

way below requirements. Fortunately the steps taken to remove the one defect can be made to serve in removing the other.

(*b*) Here we come into contact with the fuel question. Fuel is an absolute necessity. When the inability to purchase fuel is not real, it is false economy to burn refuse fodder. Weight for weight refuse fodder used as litter is more valuable than wood purchased for use as fuel. Where the inability to purchase fuel is real, the only real cure is to remove the disability. A way round the difficulty is for the cultivator to collect green leaf from waste lands for use as litter, or to grow some green leaf himself.

(*c*) There is no justification for this practice. Under the worst conditions it is possible to use earth as absorbant of the urine. This is not as good as using litter but it is better than using nothing.

It is clear, then, that if the cultivator is to improve his supply of cattle manure in quality he must make some adjustment of his fodder cattle ratio, by increasing his supply of fodder or reducing the number of animals he keeps or by doing both. He must also adopt the practice of bedding down his cattle with litter and must arrange for an adequate supply of litter for this purpose. The position at which he should aim is the production of as much fodder as will allow him to feed properly his working animals and a few breeding stock and to provide sufficient litter for bedding. If he can eke out his supply of litter by collecting green leaf from waste lands or by producing it himself he will arrive at this position so much the sooner.

This problem, the problem of determining the best means of helping the cultivator to arrive at this position, is by far the most important of the problems which confront the agricultural department. It is capable of being attacked directly and indirectly. The lines of direct attack may be classified as follows :—

1. Those concerned with the manure itself, *e.g.*, proper methods of manufacture, use of green leaf as litter, and earth as an absorbant, etc.

2. Those concerned with the cattle themselves, *e.g.*, grading up of poor stock by using a bull of good strain and gradually replacing unprofitable animals by profitable ones.

3. Those concerned with the fodder crop, *e.g.*, use of better strains or varieties, better methods of cultivation including correct methods of dealing with pests and diseases, better methods of manuring and so on.—*The Madras Agricultural Journal*, Vol. XVII, No. 8.

Variety in the Ration.

One attribute of a first class ration which is usually stressed in writings on animal feeding is that it contains a large variety of feeding stuffs, derived from a number of different plants. It is worth while to consider certain aspects of this question.

We realize at the outset that comparatively few foods are balanced, as regards the amount of protein they include, for any class of stock, and the same holds good in respect of minerals. It follows that two or three foods, at least, will be necessary to make up a ration conforming at all closely to the scientific requirements. The usual advice proffered, however, is that the number of different foods used, particularly with cows, should be seven or eight—in fact the more the better. With high producing animals the greatest difficulty often is to get them to eat enough nutrients to support the highest performances of which they are genetically capable, and in such cases the most reasonable way of tempting their appetites is to offer them a good variety of foods. It may well be claimed that, in general, variety adds to the palatability of a ration, and so is desirable on that account. We do not really know what effect palatability has on digestibility, but from our knowledge of the physiology of digestion it may have an appreciable influence. It is well known that pleasant anticipation alone, in regard to food, causes an outpouring of saliva—the mouth "waters" at the sight or smell of interesting food, even before any of it is taken in—and experiments on dogs have shown that what is true of the salivary glands is also true of the gastric glands, so that the stomach "waters" at the same time as the mouth. It may be that the other glands further down the digestive tract are also influenced. Remembering that the food is broken down ready for absorption by ferments contained in these fluids, we must recognize a distinct possibility that palatability may be useful not only as a means of stimulating the appetite but also as increasing the efficiency of digestion.

Again, there is always the danger of animals going off their feed to a certain extent if kept on one ration for a long time, and this means that a change of diet must be made. Changes in feeding are undesirable, for the composition of the digestive fluids is not entirely constant, but varies appreciably with the nature of the food that is eaten—this suiting of the fluids to the material on which they have to act has been demonstrated. A change of diet means, therefore, that the animal must produce rather different secretions, and there will always be a loss of efficiency during the change over, while we know that sudden and radical changes may cause quite serious illness. If a ration contains a

fair mixture of foods, animals are less likely to get tired of it, and so can be kept on one diet for a longer time. Another point is that the rate of digestion varies as between food and food, so that a good mixture distributes the work of breaking down the feeding stuffs to assimilable form, and of absorbing them into the blood stream, more evenly over the digestive tract. This, it would appear, must increase the efficiency of the process.

The main scientific reason advanced in favour of variety in the ration is that it improves the biological value of the proteins. As has been pointed out previously in these Notes (June 1929) proteins are made up of aminoacids, which occur in very different proportions in the different proteins. One of the simplest (glycine), for instance, is completely absent from zein, the protein found in maize but is included in casein (the main milk protein), and in the protein forming the muscles of cattle. It is obvious, therefore, that the protein of maize is incomplete and needs others to supplement it. Of course maize is not fed for its protein content which is very low, but in every case there will be wide differences between the percentages of many aminoacids in any food protein and their percentages in the protein (casein, lean meat, etc.) which they go to form. In some cases, one may be so deficient in the food that it limits the production of the required animal protein to a low level, and in all cases it is clear that there must be a large wastage of the aminoacids which the food contains in excess (the surplus can be used to supply energy but its conversion is very wasteful). Now the argument is that if you include in the ration products from several different plants, the probability is that you will get a better mixture of aminoacids on the whole, and that the risk of having the productivity of the animal held up for lack of some particular aminoacid is reduced to a minimum. The latter point obviously follows and is of great importance, for, in addition to those going to form the proteins produced by the animal, there are a number of aminoacids contained in the various body fluids and their absence might have serious consequences.

But the whole thing is a step in the dark, and no one could call it scientific. What is wanted is a complete analysis of all proteins, both those in the common foods and those built up by animals, and then it would be possible to decide what particular proteins lack in the way of aminoacids according to the purpose for which they are being fed, and what others are most suitable for making good their deficiencies. All this, however, waits for the chemist who has not yet found a way to analyse proteins fully into their constituent aminoacids, though

great progress is being made in that direction. This will add yet another complication to rationing and it may well be imagined that the farmer of the future will find, as Alice did, that it is a very difficult game indeed: the reader will probably be rather glad that at the moment we have no basis on which to build up a ration whose proteins will be so mixed as to attain their highest biological value, and that the only course open to us is that of feeding a variety of feeding stuffs, on the rather "hit or miss" principle that will improve our chances of getting somewhere near the optimum. Professor Mollgaard, the distinguished Danish authority on nutrition, has, indeed, concluded that in general there is little improvement in the biological value of the proteins by using a wide mixture of foods, and that variety is only important if the total protein fed is low and just about the minimum requirement—that is, when the wastage of aminoacids must be kept very low or some will be deficient, and limit production.

As regards experimental demonstration of the desirability of variety in the ration, there is little or none. An article by Mr. Jesse, published in this Journal (August 1925), gave conclusions reached on the question from a statistical analysis of rations fed to dairy herds in East Sussex: he found that the herds getting the greatest number of different feeding stuffs were yielding the most milk. Since then Mr. Jesse has kindly handed over his data, together with a further winter's records, to the present writer who has also studied this problem: with 2,252 returns of rations being fed, the writer found the following:—

Number of Different Foods included in the Ration	Number of different Returns	Average yield per cow per day
2	4	18.5
3	65	18.9
4	205	20.0
5	397	21.0
6	529	22.1
7	433	22.8
8	283	24.0
9	189	23.8
10	86	23.4
11	39	24.5
12	11	25.5
13	10	24.2
14	1	31.0

Very few people feed fewer than 4 or more than 10 different foods and the average number lies between 6 and 7. The table shows conclusively that those herds given the greatest variety are producing the highest yields, for the figures in the last column rise steadily, with very few irregularities, all through. But can we draw what might appear

to be the obvious conclusion—that yield is raised by variety ? The writer has considerable doubt on this point, for it may be that, over these herds, the higher the yield the better the feeding with which is generally associated greater variety—that is, that the yield may have been influential in determining the variety rather than the reverse.

This view was strengthened by a further analysis that was carried out : the effect of changes in feeding in particular herds was considered by dividing them up according as the variety had been increased or decreased since the last return, and seeing whether the two groups showed any definite changes in yield since last time. If great variety increases yield then on average those herds in which the diversity of the feeding stuffs was increased should have repaid it with a higher yield, and *vice versa* : but the result was negative, no definite change in yield being found in either group. Despite the above table, therefore, the writer regards it as not proven by these data that variety, of itself, has a beneficial effect on yield. What is certainly demonstrated is that the most successful milk-producers do feed a larger variety than the least successful, and this alone might be taken as sufficient reason for recommending a varied ration. The data mentioned above cannot be expected to solve the question with scientific exactitude, for hay was counted as one food though, of course, it includes a number of closely related but, nevertheless, different plants. We may well agree with Professor Mollgaard that variety only assumes importance when the total protein intake is just about minimum requirement—that is, in practice, with high-yielding herds—and as we see above those are the ones which do include a large number of foods. It would be expected that a good cow would be handicapped by a ration of only 2 or 3 different foods, whilst a poor one would not be induced to do any better by a very varied one, but these two cases do not ordinarily arise in practical data. Surveying the whole question, it will probably be concluded that variety in the ration is desirable, at least with animals dealing with large quantities of nutriment, but that at the moment this conclusion rests on general considerations, and that a fetish should not be made of variety until its utility has been definitely demonstrated by experimental trials.—*The Journal of the Ministry of Agriculture,* Vol. XXXVI, No. 8.

A Scheme for the Establishment of an Agricultural Colony under the Bhadra Channel.

The question of establishing an Agricultural Colony has been under the consideration of Government for some time past. The Director of Agriculture has submitted proposals for the establishment of an

Agricultural Colony under the Bhadra Channel, where an area comprising 379 acres of wet land and 442 acres of dry land (100 acres of the latter being Inam land) has been selected for the purpose.

The objects of the scheme are as follows :—

(1) To give opportunities to intelligent young men who have had training in agriculture either in Mysore or elsewhere to utilize their knowledge to the advantage of themselves and the benefit of the country. Incidentally their practical capacity will be tested and the experience gained would be of the highest value in modifying, or, if necessary, remodelling any scheme of agricultural education on economically sound lines.

(2) To open out and develop the resources of hitherto insufficiently developed tracts.

(3) To serve as centres for the spread of agricultural improvements.

(4) To furnish facilities for carrying out demonstrations of approved methods on a large scale under skilled supervision.

(i) The site chosen for the colony is calculated to furnish lessons of first hand application to undeveloped tracts where science and energy have to overcome adverse conditions of climate and environment and its success would be a convincing demonstration of what could be achieved by scientific agriculture and well-directed effort to develop the rich resources of our Malnad parts.

(ii) The main features of his scheme are :—

(*a*) To admit only ten men to the colony allowing each 30 acres of wet and 40 acres of dry land.

(*b*) The colonist to clear up all the wet land allotted to him within two years of the grant on pain of resumption by Government an extension of time being, however, granted for sufficient reasons.

(*c*) Each holding to be non-transferable for 20 years, or until all the dues are paid; but the Director of Agriculture to have authority to permit it to be transferred as a whole to a party who has had agricultural training of the standard prescribed for the original colonists.

(*d*) The estate to be impartible.

(*e*) A sum of Rs. 5,000 to be spent on wells, roads and bridges for the colony.

(*f*) The whole colony to be placed under the control of the Director of Agriculture and no expenditure to be incurred or advances made except on his express recommendation.

(iii) The scheme is estimated to cost Rs. 10,250 per man of which the colonist is to contribute Rs. 1,500 and the Government the balance of Rs. 8,750 the latter sum being treated as a loan, free of interest for four years. The Director proposes that the principal of this loan, with interest thereon thereafter at six per cent, be made repayable in 16 equal annual instalments commencing from the fifth year after the disbursement of the loan.

(iv) The larger interests of the State require that the potentialities of large expanses of fertile land locked up in the Malnad should be fully developed and the establishment of such a colony would be a potent factor in malnad improvement. The scheme involves no outright expenditure, but only a recoverable and reasonably secured advance and it secures to the work all that is best in the human element employed by offering to each colonist an assured future as the reward of skilful and strenuous work. The Board of Agriculture has also discussed the scheme at length and approved of it.

(v) Government are pleased generally to approve of the scheme and to direct that a demand for the necessary budget provision may be placed before the Legislative Council for being passed before effect is given to the scheme.

Order No. D. 11965—12037—A. & E. 153–28–5, dated 20—5—1929.

ANNEXURE.

Copy of letter No. Roc. 837–Hc. 306–28–29, dated 19th November 1928, from the Director of Agriculture, to the Secretary to Government, Development Departments.

Agricultural Colony Scheme.

In continuation of my letter No. Roc. 1199 of the 17th October 1928, I have the honour to state that I made a general inspection of lands under the Bhadra Channel in connection with their suitability for an Agricultural Colony in company with Mr. D. G. Ramachandra Rao on the 9th October. The area on close inspection proved to be one in every way suitable except that it is covered with a very much heavier growth of jungle than I had anticipated. I made local enquiries and have now no doubt that an estimate of Rs. 100 an acre for clearing the land under

the channel is not too high. I may say enquiries made by Mr. Ramachandra Rao and myself have failed to reveal as suitable an area for the purpose elsewhere in Mysore.

I instructed Mr. Ramachandra Rao to make as thorough an investi gation as possible of the area actually available as I found the maps supplied to us imperfect in certain important particulars. He has recently submitted his report with a map of the area available which is as accurate as present information will allow him to make it. I forward the map herewith which shows the shape and position of the area in relation to the Bhadravati-Channagiri road. At its nearest point the area is about 2½ miles from Bhadravati. I also enclose a statement of areas—villagewar.

The area available for the colony as ascertained from combined information furnished by the Revenue Department and Public Works Department is 379 acres 9 guntas wet and 342 acres of dry as indicated in the enclosed list. To this must be added 100 acres of Inam land which belongs to the Majjigehalli Matt and which the Matt authorities are prepared to give free of charge for the annual *kandayam*. Mr. Ramachandra Rao believes that the figure of 379 acres of wet land may be an over-estimate and that there are probably no more than 330 acres. We should thus have safely 330 acres of wet land and 440 acres of dry land, the latter being of practically no value at the present time. In other words it would hardly pay to clear the scrub jungle on these dry lands. Under these circumstances it would probably be advisable to admit only ten men to the colony allowing each 30 acres wet land and 40 acres dry land. As stated, the latter will be little better than grazing land for some years to come but may finally be used for the development of dairying or live-stock breeding as a subsidiary industry in the colony. It may be thought that the area allowed is large. However, against this we have the fact that the labour will be expensive and difficult to obtain in this area both on account of the proximity to the iron works and on account of the malarious character of the neighbourhood. We also have the fact that the labour involved in clearing this land will be undoubtedly very great. I must further point out that the whole purpose of the experiment is to ascertain whether intelligent young men who have had training in agriculture either in the Hebbal School or in an Agricultural College are able to utilize the knowledge to the advantage of themselves and the benefit of the country. They will be pioneers and I should certainly advise ensuring them a reasonable chance of making a decent livelihood.

Mr. Ramachandra Rao has given the following estimate of the expenditure involved in the establishment of such a colony. He has divided up the expenditure into that which will be common, such as the purchase of implements and machinery which can be used in common, the digging of a well, construction of bridges, roads, fencing, etc., and that which will be borne individually. As will be seen, the Rs. 5,000 set apart in the budget of the Economic Conference would just about cover cost of survey, wells and the roads and bridges which will be required to open up the area.

The individual expenditure includes that for clearing of the land at Rs. 100 an acre for the wet land and Rs. 25 an acre for the dry land, for bringing the wet land into crop at Rs. 50 an acre, for construction of farm houses and cooly quarters, for purchase of cattle and for maintenance of the man for the first year until he is able to get a return from his cultivation. Added to this is the cost of 30 acres of wet land at Rs. 25 an acre—a figure which is, I believe, not too small considering the nature of the experiment. As will be seen, if we leave out of account the sum spent on wells, bridges and roads, the total expenditure involved per man is estimated at Rs. 10,250 of which the colonist will have to put down Rs. 1,500 and the Government will have to meet the balance or Rs. 8,750 by a loan.

It must be obvious that for the first three years at least the returns will not greatly exceed the requirements of the colonist for funds to set him on his feet, for the estimate given for housing live-stock, etc., must be looked upon as a bare minimum which will have to be added to if real efficiency is to be obtained. It will, therefore, be necessary to postpone payment of principal and interest for at least three years and I would favour four years to give the man a good chance of setting on his feet. The amount should thereafter be paid back in 16 equal instalments of principal with interest at 6 per cent so that the debt will be liquidated within 20 years.

This will involve an expenditure of about Rs. 865–13–0 per man per annum. The colonist will have to make a net profit of Rs. 50 an acre over the whole of his wet land in order to pay back these instalments and still have Rs. 50 a month to support himself and his family. He should, I think, expect this much as that is the minimum pay given to our Agricultural Inspectors.

Certain very definite safeguards will have to be provided. In the first place the whole colony should be placed under the control of the

Director of Agriculture and no exqenditure or advances should be made without his recommendation. In the second place a definite time limit must be fixed for the clearing of all the wet area. I should fix this at two years. If any part of the wet land remains uncleared at the end of this period except for satisfactory reasons, the whole block should be liable to be resumed by Government. In the second place, each holding should be non-transferable until the twenty years have elapsed or until such time as all dues have been paid except with the permission of the Director of Agriculture and then only to a party who has undergone agricultural training of the desired standard. In the third place the land should be and remain permanently impartible. As to whether the colony should work on a co-operative basis that should, I think, be left to decision of the colonists although I think it certain that they will have to work co-operatively in the use of the more expensive farm equipment such as tractors, sugarcane mills, etc.

It may be asked what is to be gained from the establishment of such a colony. The most important benefit will be the concrete information as to whether agricultural education is economically sound. Unless and until information on this point can be obtained, I, for one, am opposed to launching out on further schemes of higher agricultural education. I believe information of great value should be available at the end of the first year even and within two years we should be able to form some idea of what our young men can do if provided with this sort of training.

In the second place if colonies of this sort succeed, they should serve as most valuable centres for the spread of agricultural improvements. The area where it is proposed to place this colony is one of great potential possibilities but it is at the same time one which is at present agriculturally very backward. The presence of a colony such as this carrying out operations on approved lines should have an immense effect upon the agriculture of the surrounding area. The possibilities of the usefulness of such colonies in advancing agriculture in backward tracts or in areas where it is necessary to get the highest possible returns from the land such as that which will be commanded by the Irwin Canal can be ascertained only through an experiment such as this.

Finally this colony will be in a malarious tract and we should, through the sanitary measures which will be provided there in consultation with Dr. Sweet and the Health Department, furnish valuable information in connection with our efforts to control our serious contagious diseases in villages.

The financial commitments involved are as follows :—

1. The expenditure of Rs. 5,000 on wells, roads and bridges for the colony.

2. An advance of Rs. 8,750 to each of the ten members of the colony, the loan to be free of interest for four years and thereafter to be paid back in 16 equal instalments of principal and interest at 6 per cent. If possible, the whole of this amount should be made available in the first year. At the very least Rs. 50,000 should be made available this year and the balance in the year 1929–30.

As regards the safety of the investment I may point out that the land will undoubtedly be worth at least Rs. 300 an acre if it is cleared, brought into cultivation and connected with roads so that the capital invested is assured. If the area develops as I expect it to, wet land should rise to Rs. 500 an acre in the course of a few years, so if the land is resumed to Government at any time there will be no risk of loss. The money will be advanced in small lots only after the Director of Agriculture has assured himself that previous advances have been properly utilized, so there should be no danger of the money being unwisely or wrongly spent. Finally the fact that the colonist has to put up Rs. 1,500 himself which he is liable to lose entirely if he does not meet the conditions will, I believe, deter all but the most earnest from entering the colony and will ensure every effort upon the part of the colonists to make it a success.

Finally I have induced Mr. D. G. Ramachandra Rao, one who has had long practical agricultural experience to join the colony and to act as its leader and I believe his experience and knowledge will go far to ensure the success of the experiment.

As the scheme should come into operation without delay, I have the honour to request you to obtain very early orders of Government on my proposals. In the meantime, I would request permission to operate on the Rs. 5,000 to the extent of having the area surveyed pending decision of Government. I may state that if sanction is obtained within a month's time it might be possible to get the colony going so that a first crop could be put in by June or July next.

Mr. D. G. Ramachandra Rao's estimate of the expenditure involved in the establishment of the Agricultural Colony :—

Common		Individual	
	Rs.		Rs.
Tractor implements and other equipment ..	10,000	Clearing both dry and wet	4,000
Well or water supply ..	2,000	Bringing up to cultivation seed and manure ..	1,500
Causeway and a small bridge	2,000	Buildings— 1 at Rs. 1,000 / 5 cooly quarters at Rs. 100 each ..	1,500
Road	1,000	Cattle 2 pairs	500
Fencing	5,000	Maintenance for 1st year	500
TOTAL ..	20,000	Common expenditure* ..	1,500
Deduct sum subsidised by Government	5,000	TOTAL ..	9,500
Rs.	15,000	Deduct earnest money produced by the colonists	1,500
*or Rs. 1,500 per man.			Rs. 8,000
		will have to be advanced by Government	
		Value of wet land 300 acres at Rs. 25 each ..	7,500

AREAS SET APART FOR COLONY.

Name of the Village	Survey No.	Total area	Available for Colony	
			Dry	Wet
		A. G.	A. G.	A. G.
Majjigenhalli	9	93—29	54—29	39— 0
Do.	21	42—30	13—30	29— 0
Gowdarahalli	9	97—33	52—33	45— 0
Bab Halli	22	239— 2	69— 2 (Disposed)	170— 0
Kagi Kodamaggi ..	87	72—23	..	72—23
Veerapura	46	52—23	42—23	10— 0
Thippalapura	20	46— 8	32—22	13—16
Kanakatte	8	84—23 20 disposed of	64—23	..
Do.	26	69—0	69— 0	..
Seegebagi	32	27—26 (15—26 disposed of)	12— 0	..
Kablikatte (Inam lands)	..	..	100— 0	..
TOTAL ..	..	..	442— 0	379— 9

—*The Mysore Gazette*, Vol. 64, No. 22.

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Note on the Report of the Royal Commission on Agriculture in India.

BY LESLIE C. COLEMAN, M.A., Ph.D.,
Director of Agriculture in Mysore.

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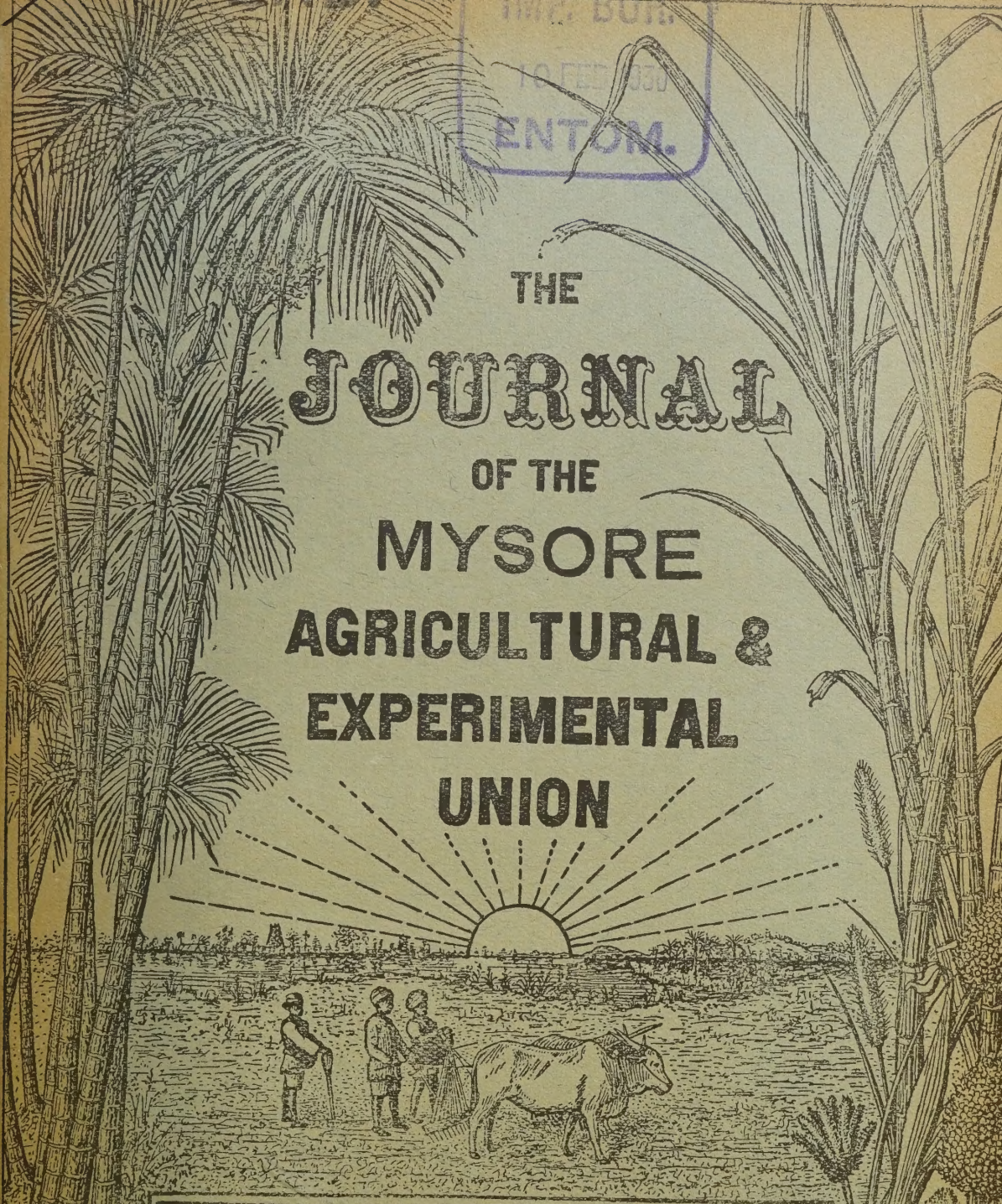

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